RCEME TECHNICAL BULLETIN

Features

CYBERNETICS
Its effect on management

STATISTICS
An engineering tool

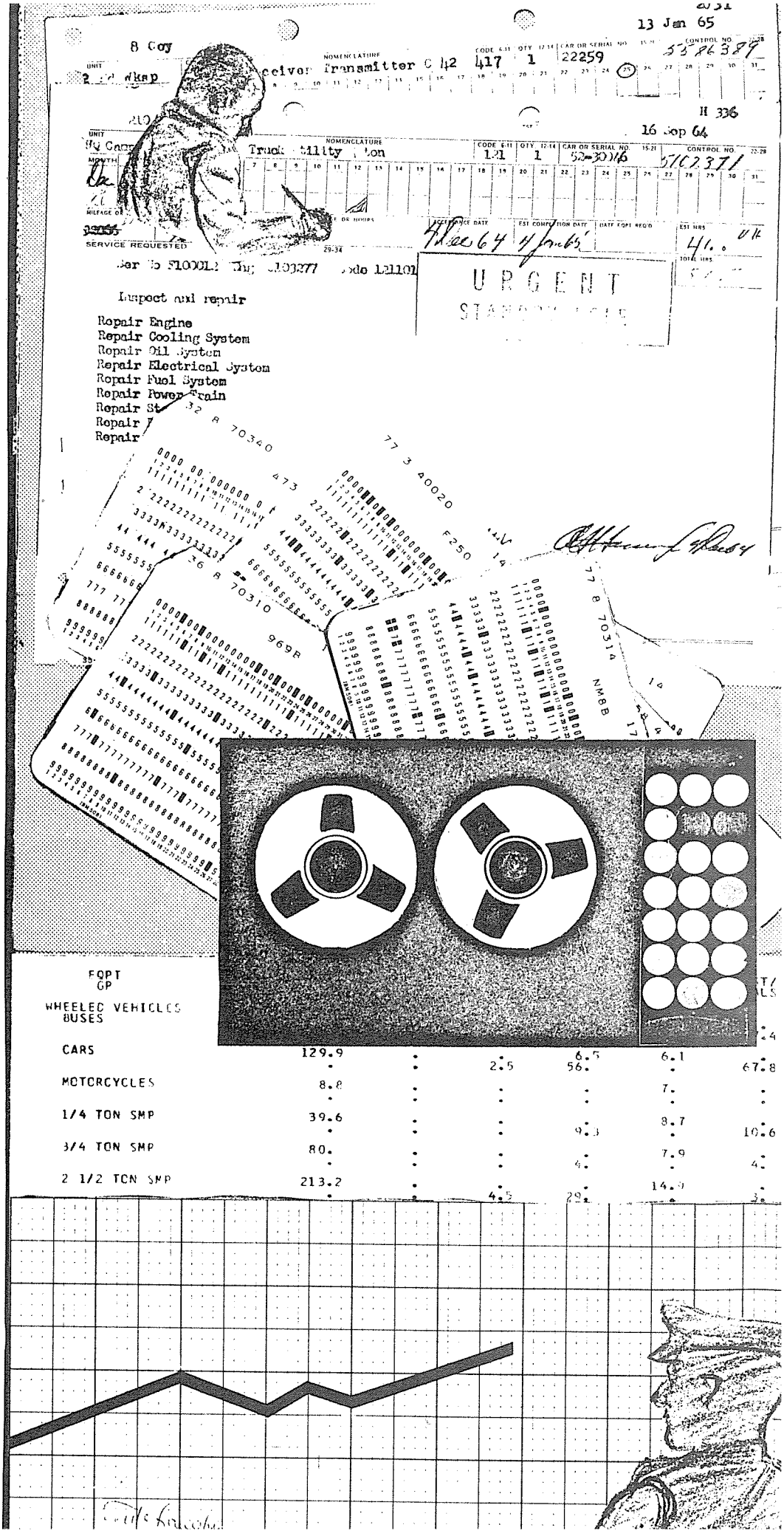
FORGOTTEN TRADESMEN
Who are they ?

CORPS' 21st BIRTHDAY
Some of the celebrations

MEMBERS RECEIVE
SUGGESTION AWARDS

SEE WHO'S WHERE
Now it's the staff sergeants

JULY 1965
VOLUME 10, NUMBER 3



RCEME TECHNICAL BULLETIN

Vol 10, No 3, July 1965

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COVER: Data from CAFC 2149 is recorded on key punch cards and summarized by computers. The summaries are analyzed and data is recorded on graphs to assist management in making decisions on establishment changes, equipment repair and condemnation policy.

This publication is issued under the authority of Col A Mendelsohn, CD, Director of Electrical and Mechanical Engineering. The contents have been approved for publication by Lt Col JP Sherren, CD.

The Bulletin is published to assist RCEME personnel in keeping abreast of current trends in developments, to amplify or emphasize technical instructions, to circulate news of Corps and individual activities, and to provide a forum for discussion and the exchange of ideas by members of the Corps. The information and statements herein do not necessarily represent official policy and are not to be quoted as authority for action.

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MANY IDEAS BUT FEW CONTRIBUTIONS

Your response to our Circulation Interest Questionnaire has been very good. Our thanks to those who took the trouble to fill out and mail them; special thanks to many who gave us their comments and ideas. Replies account for some 75 per cent of the copies distributed.

Oddly enough we haven't heard from units farthest from home who we think should be most interested in keeping in touch.

It is quite obvious that our increased distribution to units – particularly to the Maintenance Troops – has made it possible for many more people to see the Bulletin.

The April issue was sent out on a basis of 1 copy to every 10 military personnel; this ratio has been improved in the July issue. We would be glad to know of any place in which the distribution could be improved.

Some of your suggestions have been acted upon; others are being considered for later issues of the Bulletin. For instance our location list of staff sergeants is the result of a suggestion.

Another reader said "Please do not imitate the US Army PS Magazine". This started one of our active contributors thinking; for his conclusions see page 13. Although we have not the intention – nor the ability – to imitate PS we are using the Bulletin to draw your attention to important information you might not otherwise see (p 14).

Many units use procedures which might well be copied. One places a copy in the unit library where it is read by "...36 civilians".

Many suggestions just are not feasible. You may not believe this, but many, many readers desire a personal copy and are even willing to pay for it. Although we would like very much to do this, it is impossible. (It was investigated very thoroughly when the old RCEME Quarterly was forced to cease publication).

Unfortunately, with all the reader interest, we have still had to depend on DEME people for most of our content. And believe us when we state that we haven't turned down any submitted material – we didn't get one birthday party story from a unit in Canada.

We need more participation by units – one of the avowed purposes of the Bulletin is "to provide a forum for discussion and the exchange of ideas..." We don't want to do it all in DEME. Why not lay your plans NOW that some ONE in your unit will be responsible for getting a story in the October Bulletin (Deadline 15 Sep 65). Mail your contribution to

The Editor, RCEME Technical Bulletin
c/o DEME (Army) CFHQ, OTTAWA.

Some replies have an ironic twist! A captain asked for "more Corps news". However, no news came from them with the reply and one has to look back through many issues of the Bulletin to find any. One way to have more news is to do your part in supplying it.

The Craftsman *COMES OF AGE* in Europe

By Capt NA Graham and Capt FG Hutson

"I'm Twenty-one Today" was 4 Field Workshop refrain this year when they celebrated the Corps' coming of age. Highlighted in the month were ceremonies honouring the RCEME and other war dead, participation in the twentieth anniversary of the liberation of Holland, a parade and drive-past in honour of the Deputy Chief of Logistics and Engineering Development, CFHQ, an open house and all ranks dance and the giving away of a brand new 1965 Volkswagen Saloon.

On 3 May, a contingent from 4 CIBG commanded by Capt NA Graham was sent to Holland to participate in the twentieth anniversary of the liberation of the Dutch people by the Canadian Army. The party consisted of a 40-man platoon from the Workshop led by Capt EA Rochefort and the Black Watch Band directed by Lt HC Eagles.

On 4 May, the contingent took part in a cenotaph ceremony at the Canadian War Cemetery at Adegem, on the Belgian-Dutch border 12 miles east of Brugge. During the ceremony in a moving tribute to the Canadian Army, one thousand Dutch school children placed flowers on the graves of a thousand Canadian Soldiers; "Who", in the words of the Burgomeister, "gave their lives that these children might live in freedom".

The following RCEME soldiers are buried in the cemetery at Adegem:

WO 2	HS	Revill	41 LAD
Sgt	WG	Sweeny	40 LAD
Cpl	WB	Schmidt	9 CIB Wksp
Cfn	PA	Waugh	1 Army Tps Wksp
Cfn	GW	Lickiss	1 Servicing Unit

INTERNATIONAL RELATIONS Life aboard ship was experienced by the detachment while quartered on the Dutch Cruiser the Jacob Van Heemskirk. L cpl Clackett (left) and Cfn Dyson.

During the contingent's stay in this part of Holland, they were the guests of the Royal Dutch Navy and were privileged to live aboard the light cruiser "Jacob Van Heemskirk" at Flushing.

On the evening of 5 May, the RCEME Detachment took part in a floodlit Military Tattoo in the town square of Middleberg on Walchern Island. This display was organized by the Dutch Navy. After the tattoo a civic reception was held in the fifteenth-century town hall. Sgt Cains of the Workshop, who took part in the liberation of this town in 1944, was specially honoured by the Burgomeister.

Vlaardingen, a city of 70,000, 5 miles west of Rotterdam was the next stop. The contingent arrived on 6 May, and all members were accommodated in private homes. The Shell Oil Company of the Netherlands sponsored a luncheon in their honour followed by a civic reception in the City Hall. In the evening the contingent marched through the city and staged a military tattoo in one of the town squares.

The next day they were taken on a tour of the Delta Works by their hosts. This gigantic network of dykes, designed to seal off the entire Dutch coast against the sea, is one of the world's greatest feats of engineering. It was here that General Charles Foulkes, CB, CBE, DSO, CD, Commander 1 Canadian Army during the liberation of Holland, met the contingent. In the evening a Liberation Day Banquet was held in the Delta Hotel followed by a concert in which the Black Watch Band and the Vlaardingen Male Choir participated.

On their return to Germany, 4 Field Workshop received the following message from the Canadian Ambassador to The Netherlands:

"Your unit was extremely well turned out and gave a distinctive and smart Canadian presence to the many ceremonies and celebrations in which they appeared.

"It made me proud and happy to see the extraordinary welcome your men received. I feel your men have done much to maintain and even to raise the very good relations that exist between our country and The Netherlands".

At the same time, all those who took part in the ceremonies agreed that the hospitality extended to them by the Dutch people was something they would never forget.

CHILDREN HONOUR WAR DEAD 1000 Dutch children pay homage at Canadian graves at Adegem.

CENOTAPH CEREMONY Part of the RCEME Guard of Honour at Adegem. They may be seen to the right of the cenotaph in the picture opposite.

CORPS BIRTHDAY
. . . in 4 CIBG

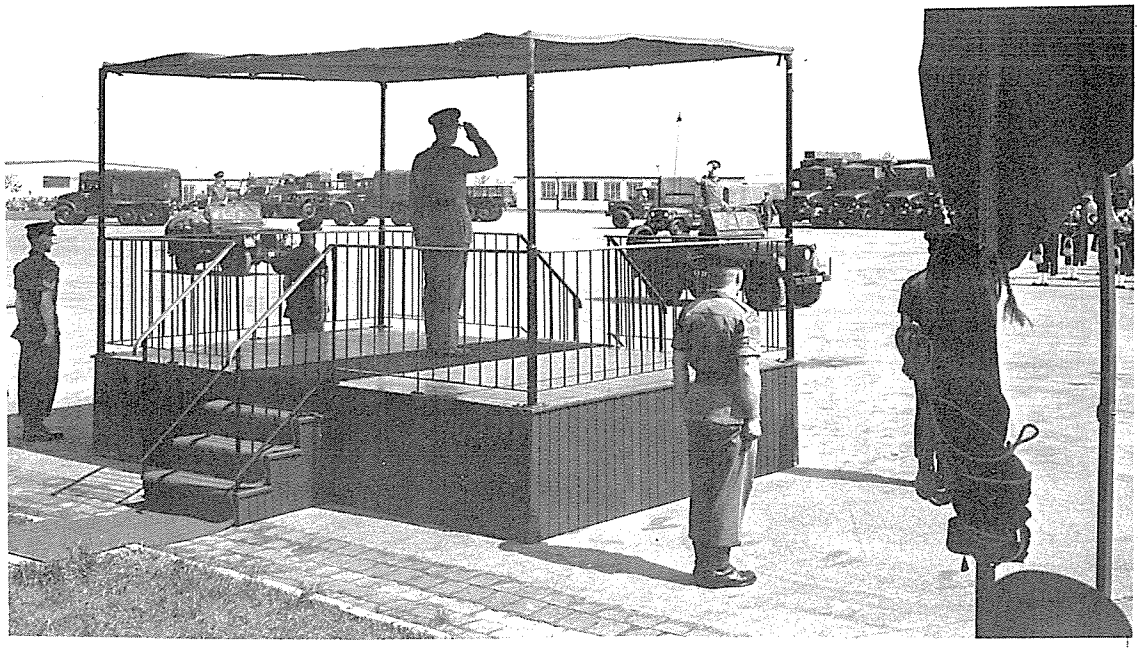
The week of the Corps birthday began with a church parade on 9 May. A stained glass window was presented to each of the Fort Chambly chapels in appreciation of the many years they have served the members and dependants of 4 Field Workshop. Following the dedication of the windows the unit marched past while the Commander 4 CIBG, Brigadier A James Tedlie, DSO, CD, took the salute. After the parade the Commander and his party were entertained at a luncheon by the officers and their wives.

Monday and Tuesday were spent frantically trying to arrange parade rehearsals between rain storms. On Wednesday, the 12th of May, everyone's spirits received a tremendous lift when, after 53 days of rain, the day dawned with brilliant sunshine. The General Salute was given on the arrival of the inspecting officer, Major General LGC Lilley, DSO, CD. After the inspection the Workshop marched past in column of route followed by a drive-past of all 112 unit vehicles. All spectators were then served cocktails and luncheon in the respective messes and adjoining marquees.

As they left the messes the official guests were presented with a souvenir of the occasion in the form of a crested aluminum letter opener.

At 1400 hrs the guests were invited to attend an Open House in the workshop compound. Here, the visitors saw many active displays of the craftsman's skills. These included demonstrations of Navaid, Infrared, Ground Surveillance radar and many other equipments and repair skills. Rides in jeeps and in the

GENERAL SALUTE With unit vehicles providing the background the unit presents arms on the arrival of the reviewing officer



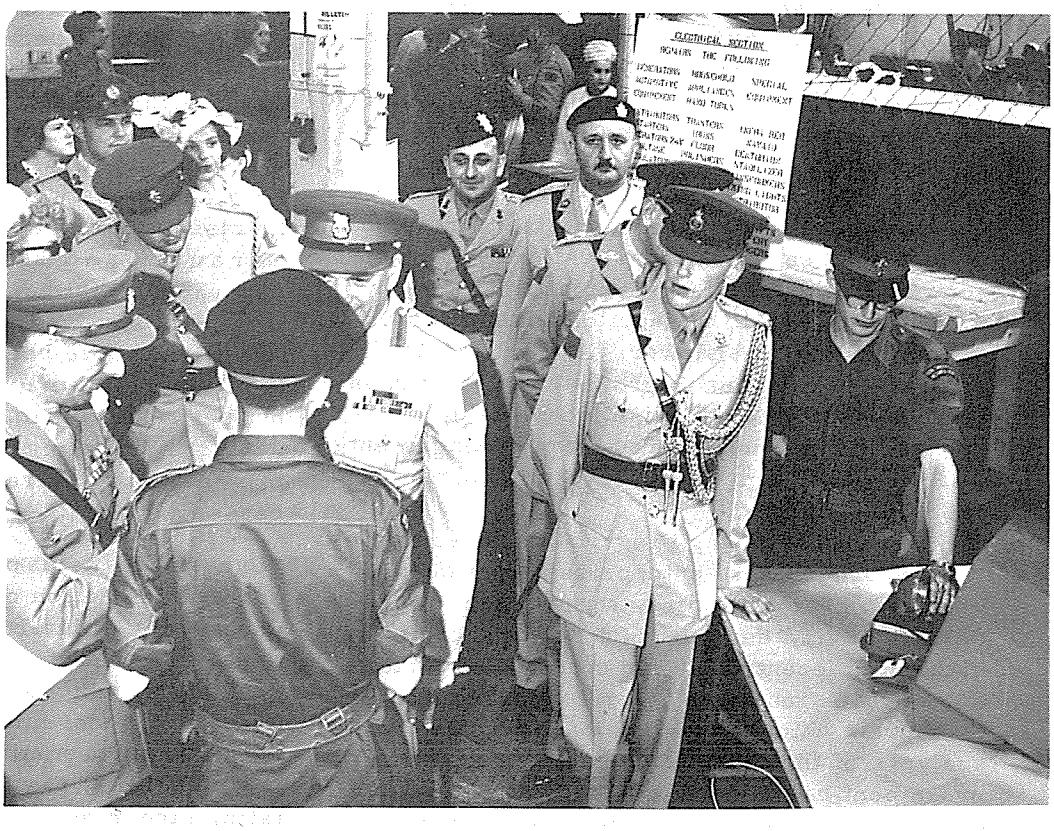
WORKSHOP DRIVE PAST Major P Bateson leads unit vehicles past the saluting base.

new M113A1 APC were very popular with the children.

The grande finale was the Craftsman's Ball held in the Schutzen Hall in Werl on the 14th of May. The 500 in attendance danced to the music of the band of the Royal Highland Fusiliers. As a special attraction during intermission the band put on a display of piping and highland dancing.

At midnight the traditional birthday cake was cut by Colonel A Mendelsohn, DEME, and Cfn WA Arvidson, the youngest member of the unit. The highlight of the evening was the draw for the Volkswagen. Colonel Mendelsohn reached into the large drum containing the 10,000 ticket stubs and drew out the winning ticket belonging to Tpr BH Davis of the Recce Sqn FGH.

After the Ball was over and the Corps had come of age, all members of 4 Field Workshop could reflect with pride on the Corps' past achievements and look forward with confidence to the future.



OPEN HOUSE
Brigadier Tedlie
and
Colonel Mendelsohn
discuss one
of the exhibits
with
Captain Graham

(See page 34 for more birthday news)

VEHICLE COMPANY team of Ssgt Wardle, Ssgt Burgess, Sgt Goodall, Cfn Lehnus and Cpl Blakeney, wins RCEME School 10 pin bowling trophy.

MANAGEMENT AND CYBERNETICS

By Maj CG Lawrence, CD

Introduction

The term management describes, in a collective sense, those officials who at various levels of authority carry out administrative processes in an organization. The number of managers in an organization is, generally speaking, dependent upon the size of the enterprise. There is a tendency, as an enterprise grows or develops, for additional levels of management or for more specialized functional management cells to appear. At the same time communications and co-ordination become more difficult and the reaction time of the organization becomes slower. Eventually, as the enterprise continues to grow, the organization becomes positively sluggish and unwieldy in response to direction given by top management or in providing timely feedback information for top management.

In endeavouring to overcome these difficulties progressive enterprises have changed organizational structure, streamlined procedures, clearly defined functions and limits of authority, decentralized or centralized various activities and have taken innumerable other measures which seemed to be indicated from analysis of their situations. While much improvement has undoubtedly been achieved, the degree of success has always been circumscribed by human limitations of managers.

Some success has been achieved in attempts to mechanize management activities. Recent developments in information technology and electronic computers is enhancing the possibilities of a rapid expansion of automation in this area within the next few years.

Cybernetics

With the increasing use of electronic program-controlled computers, cybernetics has become a much discussed subject in management, in business, in industry and in government. The term is also widely used in reference to inter-relationships between the physical and social sciences.

Many definitions of cybernetics have been proposed. All of the proposals differ in some degree, partly because cybernetics as a science is still evolving, and partly because experts in various specialized fields tend to coin definitions which are unilaterally specific. The word cybernetics was derived originally from the Greek word 'CYBERNETES' meaning helmsman or the art of steering a ship, and in a transposed sense to describe the art of governing a state.

Norbert Wiener's definition of cybernetics as the process of communications and control in men and machines is concise and useful but perhaps oversimplified. (1) Laszlo Kalmar uses the following phrases which seem more meaningful in relation to management processes:

"Cybernetics deals primarily with general laws of the organization of material systems and the processing of information within these systems, especially for the purpose of control and regulation, which are applied independently of the specific movements of matter. Following upon this, cybernetics deals secondly, according to these laws, with the possibilities of imitating higher motions of matter by lower ones in respect of given defined functions and attempts also to determine the limits of these possibilities. (2)"

Processing of information covers among other technical fields, the theory of computers and data processing and control techniques as well as the treatment of information in nerve networks of the brain. In considering the possibilities of simulating higher motions of matter

(1) Norbert Wiener, Cybernetics, (New York, 1949), p 19.
(2) The Professional Engineer and Engineering Digest, Vol 25 No 11, November 1964, p 29.

by lower ones, it should be recognized that the program-controlled computer is essentially the imitation of certain activities carried out by man.

Cybernetic Machines

The complex nature of cybernation and the general lack of comprehension of things electronic by the public has led to sensationalism in describing these remarkable machines in fiction writings and in press reporting. Terms such as electronic brain, electronic calculating machine, robot, automatic pilot, guided missile, etc, have been used loosely without recognition of possible limitations or capabilities. Nevertheless, great advances have been made in cybernetic technology, and things which seemed fantastic yesterday are virtually becoming realities of today. Thus, it is difficult to describe the nature of these machines and to assess their limitations or capabilities; however, some understanding is essential to appreciate the implications of cybernation to management.

Original developments associated with calculating machines, loosely referred to as electronic brains, are responsible for a good deal of current discussion. These machines in fact are capable of performing complicated calculations electronically rather than mechanically as their predecessors have done.

Some modern mechanisms which exhibit a reasoning capability are called robots. They are not the obedient, intelligent, human-like automatons of fiction, but rather versatile calculating machines or modern digital computers. These machines can be programed to process information according to certain rules and includes the types of machines which can play checkers or chess.

Machines that perform in a manner reminiscent of animal or human behaviour are more impressive than the complex calculators. These machines incorporate an automatic control, achieved by a servo-mechanism, which operates in such a way that it continuously regulates the performance of the machine according to the result produced by the machine's performance immediately before. Thus the output of the machine is made to control its operation, with a view to not allowing the output at any given time to exceed or to be less than a certain value.

In the sense that mechanical or electrical storage of information is analogous to remembering, machines with a memory can be built. Tremendous information storage capacity, with ready accessibility, is possible with the magnetic drum or matrix-type facility.

To the extent that thinking is analogous to solution by trial and error, machines which can think have been built. Also through experience in solving problems by trial and error, having successes recorded and failures eliminated from its memory, the machine can learn and progressively improve its performance until the probability of a correct response becomes virtually certain.

The cybernated system includes all and more of the machine capabilities of calculating, reasoning, remembering, thinking and learning.

Revolution

It has been asserted that cybernation is merely the latest stage in evolution of technological means for removing the burdens of work from man's hands. However, there is a good possibility that far more than a stage in development of technology is involved. Cybernation is so different in degree as to constitute a profound difference in kind and may during the next quarter century pose unique problems challenging the basic values and structure of our society. (3) It may, in fact, be heralding a second industrial revolution.

The most striking manifestation of the earlier industrial revolution was a great increase in production of a society equipped with new appliances which substituted power for human muscles. In spite of the upheaval in the way of life caused by the industrial revolution it made possible, within the last two centuries, development of the relatively abundant, if inequitable, social and economic world of today. From a management point of view, subsequent industrial development saw the planning function taken from the individual tradesman and given to the industrial engineer, and the skilled

(3) Donald N Michael, Cybernation: The Silent Conquest, Center for the Study of Democratic Institutions (Santa Barbara, California, 1962) p 5.

worker replaced by unskilled workers. Substitution of factory for the old domestic production system gave rise to management hierarchy in industrial, financial and governmental institutions. Today executives and administrators play a vital role in our modern dynamic society. Individuals of talent have developed great competence in management of successful private enterprises and governmental institutions. Basic principles have been enunciated, scientific methods of procedure have been developed and, based on these, organizations have been structured. Although a degree of mechanization of production has been achieved the administrative activities are still based primarily on man's brain power and personality.

The second industrial revolution, replacing man's brains by cybernation, will increasingly permeate our social, political and economic life as more automatic control is introduced. In the near future, cybernation is going to be the means by which the management functions of big business, government, production, finance, communications, trade and distribution are carried out. As cybernation progresses, changes in structure of organizations and in methods used will be necessary because of the very basic differences between mechanical information processes on one hand and human beings on the other.

Advantages

Performance of cybernated systems exceed by far the human capacity for precision and rapidity. The methods used cannot practically be duplicated by humans. These systems can make judgements on the basis of instructions programed into them. They can also remember and search their memories for appropriate data programed into them or acquired as a result of previous manipulations of data. Thus, in a given environment, the cybernated system learns on the basis of past experience. (4)

Computers have been used in business for less than ten years and yet the applications already are numerous, ranging from solving complex problems to routine accounting tasks. Applications include analyzing market research data, preparation of sales forecasts, selection of personnel, training of managers, processing insurance policies and airline reservations. Their most extensive use, however, has been in the areas of production planning, scheduling and distribution where they determine the most economic combinations of materials, machines, men and other facilities to produce and distribute a range of products. (5)

Problems

Although some computers have been installed for simple routine accounting functions, it has been with the expectation that other applications would be developed to use the remaining capacity and capability. Results have frequently been disappointing because management has either lacked the scientific background to make good use of this new tool or has not made the effort to develop the truly integrated planning, control and analysis methods that fuller computerization makes possible. Business organizations are structured around human qualities which can never be adequately duplicated by machines. Cybernation requires a change in organizational structure to allow for man/machine relationships, so that the machine can extend the power and reach of the human being rather than replace it.

Scientists have designed computers for management purposes on the assumption that scientific management methods would be used. Some uninformed managers naively assumed that the computer already had the solution to management problems built in, or that very little work was required to extract a solution from the computer. The computer can readily process, analyze and manipulate large amounts of information. But more than pressing a button is involved – the scientific methods to determine what data should be processed and how the results are to be interpreted must be applied first. Until the computer is programed it is like a newborn child with an empty brain. All the experience and information required for even the simplest task must be analyzed and encoded into instructions for the computer.

Machines cannot entirely replace human management. However, if human and cybernetic capabilities are properly combined, management methods can be developed in which the

(4) ibid, p 6.

(5) The Business Quarterly, Winter 1963, Vol 28, No 4, p 60.

span of control, the speed of reaction, and decision-making ability in complex situations can be tremendously improved. Development of the scientific management methods and the appropriate organizational structure to integrate man/machine relationships, is a real challenge to management.

Effects of Cybernation

Cybernation will lead to problems of unemployment and changes in employment. Already, with the limited introduction of automation, the number of production jobs is decreasing at the same time as the output is soaring to record levels. To further complicate the situation, the world population is increasing at an explosive rate to produce more and more potential workers. Production workers can be absorbed to some extent in service industries because with the rapidly expanding population the need for services will also rise. However, in time, cybernation of the service industries will tend to eliminate the service worker. Also methods of fabrication used by cybernated factories will make replacement of assemblies or complete equipments more efficient and less bother than repairing it, thus eliminating more service activities.

Clever maintenance and repair people will never become completely unnecessary, and the needs of cybernetic systems themselves will give rise to an increasing demand for engineers, scientists and technicians. However, if people cost more than machines – either in money or because of managerial effort involved – there will be growing incentives to replace them. Even though people may be cheaper, service organizations may not be prepared to accept the complications of union negotiations, strikes and higher wages, in preference to investing in cybernation.

The new information technology provided by cybernation will cause changes in the management structure. Just as the planning function was taken from the hourly worker and given to the industrial engineer, it will again move upward from middle management to a new and as yet unnamed type of specialist similar to an "operation researcher" or "organization analyst". Large industrial organizations will become highly centralized and the majority of innovating, planning and other creative functions will be performed by top management. Access to better information will allow fewer people to do more work. Top managers will find that by using specialist researchers and analysts, that much of the middle management can be reduced to a stereotyped routine process following rigid rules for day-to-day decisions. Much of this can be programed and the middle managers can be progressively eliminated.

The middle manager, thus squeezed out of the organization has nowhere to go and presents a special and poignant social problem. There is not room at the top, except for a very few, and the traditional organizational pyramid, on which to climb and on which to learn, is gone. Middle managers represent a large number of people in society; the group with the greatest emotional drive for success and status. Any change in status of this income level group will lead to drastic changes in consumption levels and inevitably to changes in the pattern of society.

The new middle elite, the engineers, operations researchers and system analysts, may inherit the social position of the middle manager group which they have replaced; however, this group may have different tastes and attitudes leading to new patterns in consumption levels and taste.

There is a comparatively rare group of people who provide specialized professional services. These people have special talents, education, motives and aptitudes not shared to any degree by those people who work at routine tasks. Their jobs require judgements about people by people and include specialists in fields of law, medicine, teaching and research. Cybernation can do much to remove time-consuming routine tasks from these people and vastly extend the scope and reach of their activities. Even if the demand for the numbers of this group of people is reduced by cybernation, the calibre of individual required will increase proportionately.

Millions of adolescents, who will seek work each year, would normally join the untrained or poorly trained workforce; however, now they will join the repository of untrained people displaced from their jobs by cybernation. Apparently the only alternative for the majority of these people, who are unsuited by motivation or intelligence to be trained for work above the untrained level, is to loaf. If they loaf, they will become delinquents and contribute to further social disruption.

Solutions to Problems

Retraining is often proposed as a solution for the problem of coping with adults and young people displaced by cybernation. This would undoubtedly provide a partial solution, particularly in the early stages, provided training was for jobs not about to be automated. However, for retraining to be effective, a tremendous research and planning effort and a high degree of co-operation among business, labour, education, service agencies and above all government would be required. It would have to be started now in order to be ready when needed. The task is formidable; it may well be insuperable.

Shorter work hours has been suggested as a solution provided workers received same pay so that they could continue to consume the products of cybernation. However, cybernation often eliminates types of jobs, and more than likely the new tasks arising from cybernation will require different talents. Thus shorter work hours alone does not offer a promising solution.

A vast and continuous public works program has been suggested as a solution. This suggestion may have much merit in that all democratic states seem to be rapidly approaching the status of welfare states as governmental controls and intervention spreads more widely into every activity of society and economy. The government will be forced to support, perhaps indefinitely, some portion of the population. There is no limit to the possible scope of public works programs. These could be devised specifically to stimulate the economy in certain aspects and areas which would tend to re-absorb part of the work force thus slowing down the ill effects of cybernation.

Other suggestions such as migratory workers, emigration to less developed countries, control of the birth rate and earlier retirements all apparently have short term advantages and may be useful interim measures in easing the agonizing adjustment of society to the new environment.

In summary there are no simple long term solutions to the problems of cybernation. Government will inevitably have to play a large part in presiding over the social revolution. Cybernation can be introduced selectively by organizations and localities. If the economy is supported to an overwhelming degree by government public works programs, it may have a significant effect on the attitudes and aspirations of society as a whole. It may be difficult to mould new attitudes that will continue to be favourable towards maintenance of a capitalistic economy. Thus, encouraging the extension of cybernation to develop free enterprise and better profits may be self-defeating. It seems evident that society will be forced to re-evaluate its basic principles and preconceptions about the vices and virtues of work, inflation, the national debt and governmental control.

In spite of the agony which may be experienced through uncontrolled introduction of cybernation, without regard to the human factors involved, the change to cybernation is inevitable. All major economic units, including American, European and Russian, are faced with competive threats to their well-being which makes the need to cybernate so compelling. Tremendous effort and planning on an extended plane is necessary to avoid chaos. Government, in terms of the scope of its operations, is the largest of all enterprises and the only agency with the necessary reach to control the situation. A greater degree of centralization and a more positive direction of economic and social life by government may be necessary to exercise effective control.

Enterprises must be willing to spend large sums of money to mechanize their operations in order to increase output and reduce costs. It is no longer a question for a progressive enterprise, whether to cybernate or not, but rather how and to what degree. Hesitation in this area while the competitor cybernates could be fatal.

The demands for an increased rate of growth in the gross national product, to provide for the explosive rate of population increase, cannot in the future be met without cybernation. By reducing the number of people in an organization, cybernation lessens the human relations tasks and permits a greater rationalization of managerial activities. Current information, updated continuously, to predict the probable consequences of specific decisions, based on present and extrapolated circumstances is a powerful management tool. More precise and better substantiated decisions can be made in any area of business strategy, government economic policy, equipment systems planning or military strategy and tactics.

The future environment can be predicted more completely and more clearly by computer analysis, thus facilitating better control over the system as it operates and as changes are introduced. Distances will no longer be a barrier. Widely dispersed installations can be coordinated and controlled from still another place. Government and industry will have greater freedom in organizing facilities for production and distribution in relation to raw materials, markets, transportation and people.

Conclusions

Conquest by cybernation cannot be resisted. Competition and, in fact, survival of economic systems and enterprises makes the need to cybernate now urgent and compelling. Economic needs, arising from the population growth, cannot be provided for in any other way. The great sources of nuclear power, vastly improved communications capabilities, space travel and advances in physical science technology now becoming available to industry require management of a high calibre at even higher levels and in broader scopes.

A social as well as an industrial revolution is involved because of the impact on society and on man's way of life, of the economic factors arising from replacement of man's brains by machines. There is a danger that most humans will become completely dependent upon the cybernated system. As cybernation becomes more complete, there will be a problem ensuring that human beings maintain sufficient interest in the system, particularly when the mechanisms become highly reliable, so that human control can be reinstated in times of crises or when some completely new factor arises which is beyond the comprehension of the cybernated system. Top management will require great talent and dedication; however, these people will have tremendous power. This power could be used for good or evil. It is essential, therefore, that some means of monitoring these activities be included in the plan. This probably means surveillance by government thus placing even greater and more complete control in government hands.

Top management can never, in the final analysis, be replaced by machines because man has intangible qualities which cannot be defined or measured and thus cannot be simulated by machines. Decisions taken at the highest level in management are largely subjective. In this area there is a complete absence of formulated rules; all relevant factors are considered and the conclusion may, in the opinion of the individual forming it, be based on these factors. However, he must, perhaps subconsciously, give weighting values to all factors and this imponderable weighting element cannot conceivably be programed into a machine. To do so would make the machine equal to or superior in all respects to the human and in effect would deny the spiritual nature of man.

The man/machine relationships that will arise clearly indicate that scientific method is the only practical approach to management. The term 'management' will in the future be used to describe man/machine relationships. The number of managers will not depend on the size of the enterprise but rather upon the degree or stage of cybernation. Demands placed on the resourcefulness, energy and integrity of top managers will not decrease. A new analyst-type of individual as a link between the machine and top manager will be introduced. Middle management as such will almost completely disappear in the cybernated system.

The hours of work for all but top management will be drastically reduced until a relatively small proportion of an individual's time is spent on the job. The need to be concerned about the humanistic side of enterprise will be lessened because human needs for self expression and satisfaction will be met more and more through social activities outside the place of work.

Social scientists and those managers advocating the more humanistic approach to management could more advantageously direct their energies toward solving the social problems which will arise. Eventually some people, perhaps a large proportion of the population, will never work during their lifetimes. Attitudes towards, and concepts of, the basic principles of human social behaviour must be re-evaluated.

The material well-being of mankind can be increased by cybernation. A large percentage of the human race can be liberated from the unimaginative drudgery of work. There is a great opportunity for exercise of creative ingenuity and wisdom in dealing with human affairs. Our attitudes to work, the virtues of work and the satisfaction experienced from a job well done must be replaced by some social source of satisfaction.

In Retrospect

The Award of Member of the Most Excellent
Order of the British Empire

to

SP 35225 Warrant Officer Class 2
(Armament Quartermaster-Sergeant)
Alexander Joseph Christensen
Royal Canadian Electrical and Mechanical Engineers
attached to the
Vehicle Company, 1 Canadian Central Ordnance Depot

By Lt Col RH Hodgson CD

DND Photo 27 COD London

ETQMS (WO 2) AJ Christensen, MBE

Alexander Joseph Christensen joined the Permanent Active Militia on the 1st of September 1938 at Esquimalt, BC. He was posted to 1st Field Park RCOC of Regina and went overseas with the First Canadian Division.

He was attached to the Vehicle Company of 1 Canadian Central Ordnance Depot in England.

He returned to Canada and to 217 Workshop RCEME, Esquimalt, after the Second World War. In 1948 he was transferred to the A and T Staff. From 1950 to 1954, he served with 1 Company RCEME in London. The remainder of his service was with 202 Base Workshop RCEME, Montreal, until 1961 when he was posted to 204 Base Workshop RCEME, London, for his retirement in June 1965.

During his service, ETQMS (WO 2) Christensen made many contributions that increased the efficiency of The Corps. His Citation reads in part:

"In this regard he has put forward many suggestions for improvement in procedure and equipment which have been adopted. The ingenuity and enterprise shown by this Warrant Officer is outstanding and deserving of special recognition."

COMIC BOOKS ?

By S sgt P Johnson

Technicians and engineers who are accustomed to using orthodox technical books and journals in their work, particularly those who enjoy reading for its own sake, seem to be almost unanimous in their disapproval of the format of the preventive maintenance publication, "P. S." Nevertheless, their familiarity with 'Connie Conrod', et al, indicates that despite their disapproval they do read it, and that at least some of what they read they remember.

I must admit that I am one of their number. When I first saw PS I was amazed, amused, and a little shocked that technical information for technical people should have to be presented in such a story-book, almost fairy-tale form. Yet I find myself still peeking into the new issues, when I think no one is looking, and enjoying them too!

Why is this? What is so attractive about PS? Why is it published at all?

All the information in PS (which, incidentally, is very accurate), is already available in TMs and other orthodox publications. Readers are constantly referred to these sources in even the most exotic comic-strip adventures of one dough-head or another. In other words, PS does not present new information per se as much as it jogs the memory as to the availability and whereabouts of existing information; information with which the reader should already have made himself familiar through normal channels.

There is no doubt that as a memory-jogger PS performs a valuable service. A tremendous amount of technical information is constantly being published, and there is a tendency to overlook or ignore much, or most of it, because of the pressures of the normal working day, and the feeling that paper-work is not too important as long as the REAL work is being done. Few people want to waste their time looking through long lists of available publications, on the off-chance that there might be one or two points of interest to them. Presenting this information in a form that people enjoy reading, whether they want to or not, is an art worthy of some analysis.

The foundation of the PS presentation is the comic-strip. This, one of America's best-known contributions to mass-culture, is a combination of the arts of the story-teller, the illustrator, the motion-picture director, and lately, the propagandist. The propagandist selects the point to be emphasized, the story-teller weaves a tale around it, and the illustrator creates the pictures which tell the story. The motion-picture director gets into the act because the principles of the comic-strip are directly comparable to those of the motion-picture.

"A picture is worth a thousand words", goes the saying, but it must be the right picture, or series of pictures, if a specific story is to be impressed vividly on a person's memory. The master film-makers of the silent movie days, DW Griffith and Eisenstein, realized this, and moved the camera out of the audience and onto the stage, for increased dramatic emphasis and emotional impact. Their techniques of startling close-ups, long shots, medium shots, masked shots, etc, have all been applied to the comic-strip, together with more recent discoveries about the arresting, attention-grabbing effect of certain colours and colour schemes. (The home-movie maker could learn a lot about making his movies more interesting by studying comic-strips from this point of view.)

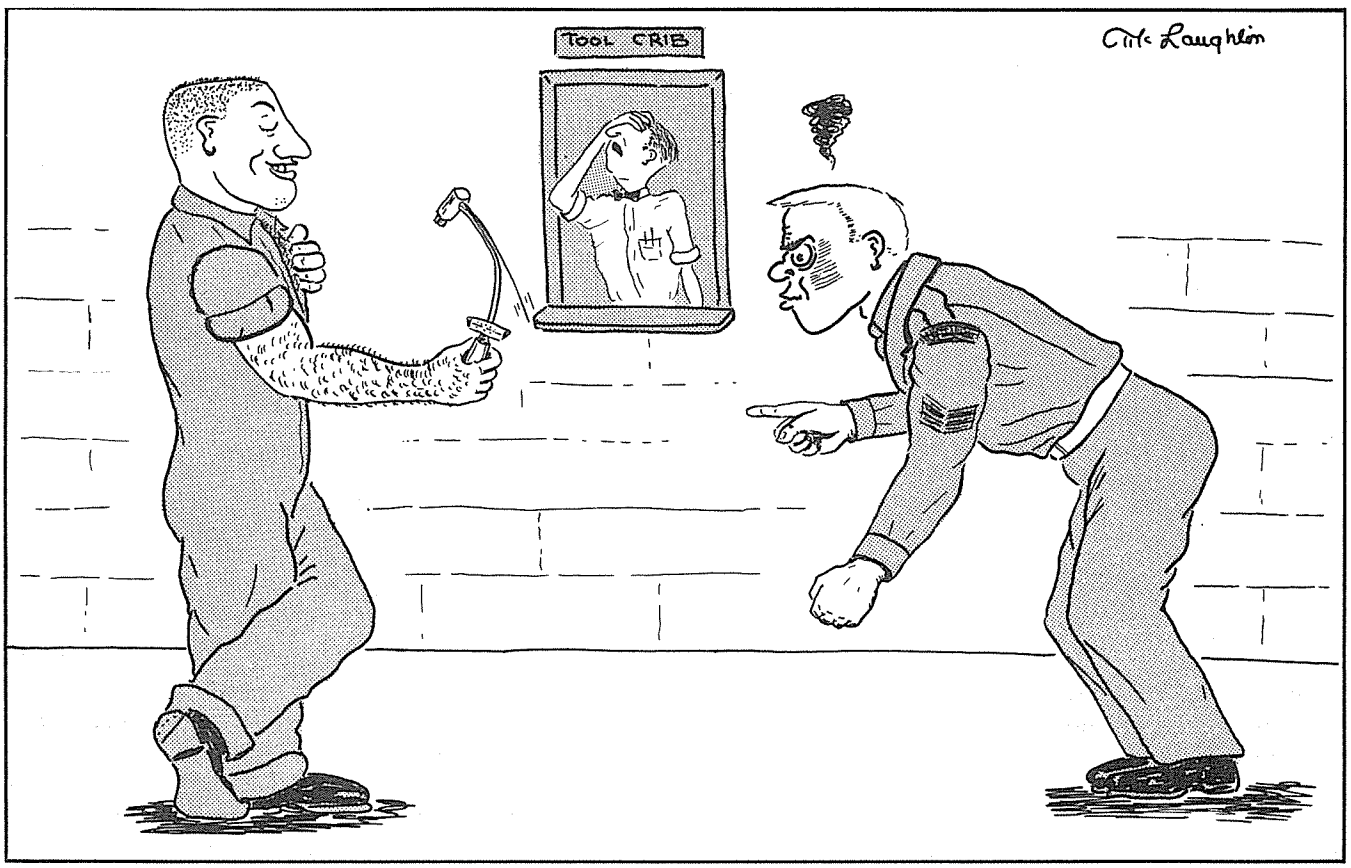
Dialogue is extremely important too. 'Peanuts', and Jules Feiffer's satiric cartoons are excellent examples of how well-chosen dialogue can round out a few primitive drawings into a complete and pointed story.

There is no doubt that the well made comic-strip, like the well made movie, has a tremendous emotional impact. The readers (or the audience) tend to identify themselves with the characters they admire; in PS with

the lean efficient hero rather than with the flabby dunderheaded 'Sad Sack'. Consciously or unconsciously they try to emulate the hero to some extent, to avoid doing those things which, according to the strip, stamp a man a Sad Sack. By making the hero an avid reader of TMs, and a stickler for correct maintenance procedure, the desirability of these things is impressed upon the mind of the reader.

This, of course, is the aim of PS: to impress upon the reader the importance of proper maintenance, and to remind him of the existence of pertinent TMs, etc, through an appeal to his emotions.

Looked at from this point of view, rather than in comparison with our own Technical Bulletin, PS is seen as an excellent little publication which, thanks to the time and effort devoted to it by many talented people, to say nothing of the cost of its production, performs its function extremely well. In view of this, I shall henceforth read it openly, and try to refrain from supercilious criticism on irrelevant grounds.



I SURE TORQUED THAT HEAD DOWN REAL GOOD SARGE!

YOU'LL DO WELL TO NOTE...

Three new EME Manuals of great general importance have recently been published, which readers should make a point of seeing.

General N 120 dated 7 May 65 comprises a Torque Manual (P. A. Sturtevant Co, Addison, Ill) which contains invaluable up-to-the-minute information on the subject of torque wrenches.

Another new manual is Instruments A 253 dated 17 Mar 65 which will bring you up to date on the sealing of all types of instruments; what to use and how to use it.

The third has to do with the Metal Inert Gas process for welding aluminum, Miscellaneous Equipment O 380 dated 9 Apr 65. With the introduction of more and more heavy aluminum plate into the army equipment this is now of prime importance. This manual introduces the ALCAN Service Bulletin "Manual MIG Welding of Aluminum, 1964".

ANNUAL GARRISON INSPECTION

The Sudbury RCEME Militia Unit, 33 Tech Sqn, took a prominent part in the Annual Garrison Inspection by Brig JB Clement, CD, Area Commander, Central Ontario Area.

Eighty per cent of the unit personnel were on parade and three members of the squadron received the Canadian Forces Decoration (CD): S sgt EA Trueman, Sgt JA Holder and Cpl SP Adam. The Unit came in for honors as well, as shown in our pictures.

The squadron will spend seven days in annual training at Camp Niagara.

Major LM Ramsey, CD, Unit OC, Capt AH Closs, CD, Unit Training Officer, and WO 1 AL Hartley stand ready to receive presentation of shield, cup and plaques from Brigadier Clement.

Brig Clement presented:

- to Major Ramsey, the RCEME Corps Association plaque for highest aggregate rifle score in Canada for 1964.

- to Capt Closs, a cup and a plaque for the highest percentage of personnel qualifying for Group 1.

- to WO 1 Hartley, shields and plaque for shooting in Central Command, 1964.

-Sudbury Daily Star photos

MAKE STATISTICS AN ENGINEERING TOOL

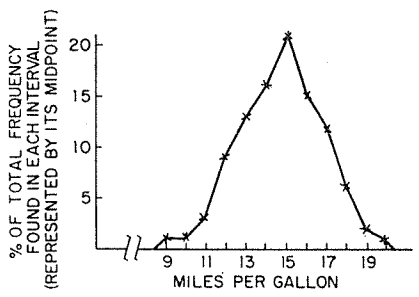


FIG. 1 **A frequency polygon** of the data in Table 1 gives a visual description that helps identify the statistical model to be used for analysis.

TABLE 1 — Results of 100 Fuel Economy Tests (mpg)

17.74	12.17	12.22	13.89	16.47
15.88	16.10	16.74	17.54	17.43
14.57	12.90	12.81	14.95	16.25
17.13	14.46	14.20	16.90	11.34
12.57	13.15	16.53	13.60	13.34
13.67	14.23	15.81	16.63	11.40
14.94	13.66	9.79	13.08	14.57
14.93	14.01	14.43	16.35	15.65
11.52	17.46	14.67	15.92	16.02
13.46	13.70	14.98	14.57	15.72
14.57	14.79	12.21	15.84	15.35
12.19	14.37	11.32	12.74	13.38
15.10	18.03	19.09	9.34	14.41
15.12	15.27	17.46	17.65	17.95
11.67	12.15	14.36	16.32	14.05
18.27	16.57	16.10	14.35	20.04
15.18	17.42	14.50	13.21	15.10
13.59	16.98	12.64	15.27	15.84
17.18	14.69	16.35	13.05	13.37
15.46	18.84	12.14	15.42	11.76

The growing use of computers and build-up of packaged computer programs are giving engineers another tool for everyday use – statistical analysis. This is a timely tool since the emphasis on product reliability in recent years is demanding engineering answers that can best be handled by statistical techniques.

The problem for the engineer using this tool is twofold. First, he must learn a new language that talks of regression, mean, deviation, and density functions, just as he learned of stress and strain, or integration – and second, he must catalog the various statistical solutions that can help solve his problems. After this, the computer becomes the way that large masses of data can be handled, either for condensation or for carrying out long statistical calculations.

What is the Population Doing?

The "population" is all the data there are on a given subject, whether you happen to have it in hand or not. Usually, only a small sample is available and the problem is to extrapolate statistically to find out what the "population" is doing. An example would be a gas mileage test on 100 cars being used to tell the expected results on the thousands of similar cars yet to be manufactured. Another example could be predicting the fatigue life of the arm holding the points in a car ignition system from a series of samples run in the laboratory.

In each case the first step is to convert the data into a statistical form that is understandable to others and convenient to handle statistically. This is done by plotting a frequency polygon to help recognize the pattern the data are forming, and then calculating its statistical characteristics.

The frequency polygon for the 100 gas mileage tests given in Table 1 is shown in Fig 1. This curve was drawn by:

a. Dividing the data into groups, in this case 8.5 to 9.5 mpg, 9.5 to 10.5 mpg, 10.5 to 11.5, etc.

b. Counting the number of test runs that fell into each of these 1-mpg intervals.

c. Calculating a percentage frequency for each interval by dividing the number of runs falling into an interval by the total number of tests.

d. Plotting these percentages versus the midpoint of each interval

The pattern of this curve shows the test results as roughly symmetrical about the peak and dropping off from the peak. This pattern identifies the statistical model for the population as a normal distribution (sometimes called a "bell-shaped curve" or "Gaussian density function"). (In the case of the ignition points, the corresponding curve would usually be skewed to the right and a Weibull distribution could be used to estimate what the population was doing).

Having identified the pattern, the data from the mileage tests can now be communicated by two numbers, and predictions can be made about the population. This is done by using the data to estimate a mathematical normal distribution that depends only on two factors, its mean value, μ, and its standard deviation, σ. Fig 2 shows the effect of these two parameters. The mean value, μ, describes the "center of gravity" of the curve and also its most likely value. The standard deviation, σ, describes the dispersion or spread of the curve about its mean value. By estimating these two parameters from test data, a probability curve for the population can be found. This then serves a double function. First, the estimated values of μ and σ can be used to communicate the results of 100 tests. Second, the area under the normal density function curve described by μ and σ tells what the population is doing. Actually, all the calculations concerning the area under the curve have been tabulated, so quick answers are available to questions like: "What percentage of cars will get less than 15.5 mpg?" Graphically, the answer is shown in Fig 3.

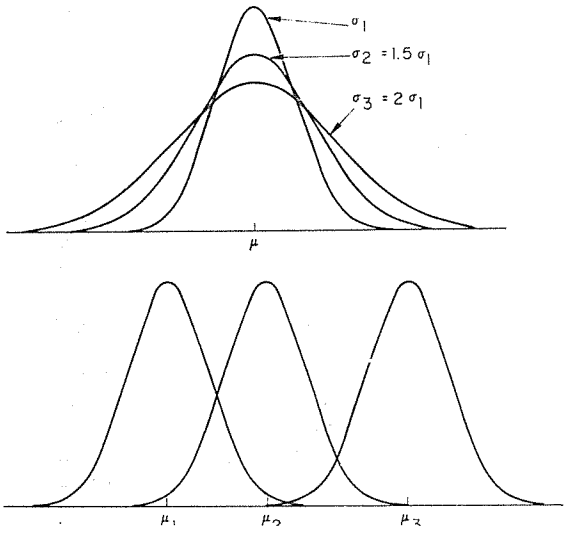


FIG. 2 Standard deviation σ, describes the dispersion or spread of the curve about its mean value. The mean value, μ, describes the "center of gravity" of the curve and its most likely value.

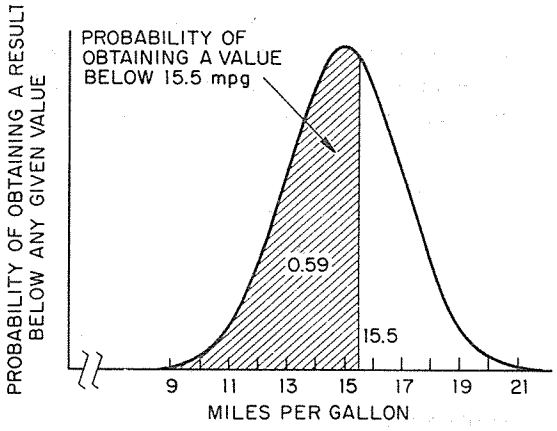


FIG. 3 Probability curve for the population serves double function. First, estimated values of μ and σ communicate the results of a series of tests. Second, area under the curve described by μ and σ tells what population is doing.

The two parameters μ and σ are estimated from the following equations:

$$\mu_{(\text{estimated})} = \bar{x} = \frac{1}{N}\sum_{i=1}^{N} x_i = \frac{1}{N}(x_1 + x_2 + x_3 + \ldots + x_N)$$

$$\sigma_{(\text{estimated})} = s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2} = \sqrt{\frac{1}{N-1}\left[\sum_{i=1}^{N} x_i^2 - \frac{(\Sigma x_i)^2}{N}\right]}$$

where:

$\bar{x}$ = Average of the test values

N = Total number of tests

s = Root mean square of the test values

x_i = Any specific test value

For the data in Table 1:

$\bar{x} = 14.80$ mpg estimates μ

$s = 2.06$ mpg estimates σ

The notations, $\bar{x}$ and s, are used to mark values calculated from the sample. They are only estimates of μ and σ since these, strictly speaking, refer to a population that is not known exactly.

With the calculation of $\bar{x}$ and s, it is not necessary to approximate areas under curves

like Fig 3. A tabulation of these areas or probabilities as percentiles is given in Table 2. To find the answer to, "How many cars will get less than 15.5 mpg?" we calculate:

$$\bar{x} + K(s) = 15.5$$

or:

$$14.80 + K(2.06) = 15.5$$
$$K = 0.34$$

From Table 2, the percent of cars below 15.5 mgp is 62.31%, or about 62%.

Another type of question that can also be answered is, "What is the range or spread of gas mileage if 95% of the cars are to be included?" For this calculation a spread or interval of $\bar{x} \pm K(s)$ is needed that will account for 95% of the area under the curve. Since Table 2 is given in percentiles, we use the K value that corresponds to 97.5% (0.975), thus clipping off 2.5% from both the high and low ends of the mileage curve. From the table, the K value is 1.96, and the answer is:

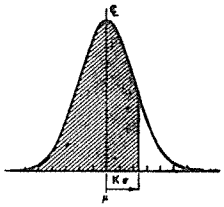
$$14.80 \pm 1.96(2.06)$$

or:

$$14.80 \pm 4.04 \text{ mpg}$$

TABLE 2 **Percentiles of Normal Distribution**

(Probabilities of obtaining a value less than or equal to $\mu + K\sigma$ for values of K from 0 to 3.)



K	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6180	0.6217	0.6255	0.6293	0.6231	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7579	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9146	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9811	0.9816
2.1	0.9820	0.9825	0.9829	0.9833	0.9837	0.9841	0.9845	0.9849	0.9853	0.9856
2.2	0.9860	0.9863	0.9867	0.9870	0.9874	0.9877	0.9880	0.9883	0.9886	0.9889
2.3	0.9892	0.9895	0.9897	0.9900	0.9903	0.9905	0.9907	0.9910	0.9912	0.9915
2.4	0.9917	0.9920	0.9921	0.9924	0.9926	0.9928	0.9929	0.9931	0.9933	0.9935
2.5	0.9937	0.9938	0.9940	0.9941	0.9943	0.9944	0.9946	0.9947	0.9949	0.9950
2.6	0.9951	0.9953	0.9954	0.9955	0.9957	0.9958	0.9959	0.9960	0.9961	0.9962
2.7	0.9963	0.9964	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9971
2.8	0.9972	0.9973	0.9974	0.9974	0.9975	0.9976	0.9976	0.9977	0.9977	0.9978
2.9	0.9979	0.9979	0.9980	0.9981	0.9981	0.9982	0.9982	0.9983	0.9983	0.9984
3.0	0.9984									

Capsule of Statistics Terms

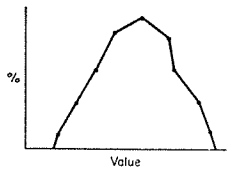
POPULATION

All possible data on a subject . . . rarely available . . . treated mathematically as an infinite number of data points.

SAMPLE

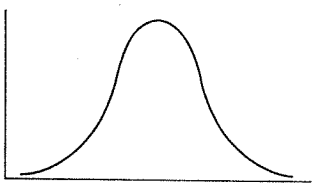
Data actually available . . . used to estimate the underlying population.

FREQUENCY POLYGON



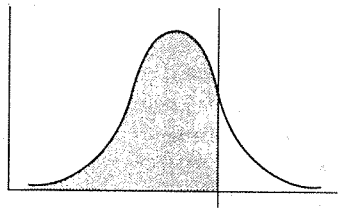
Data from sample plotted to show how often different data values occur.

NORMAL DISTRIBUTION



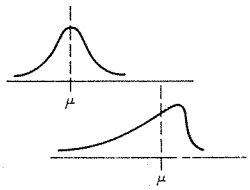
A frequency polygon for the population, scaled so its area equals 1. Mathematically calculated as a normal probability density function. (Other probability density functions are used for data that doesn't plot symmetrically.

PERCENTILE



Probability of population being less than a particular value. Equal to shaded area under curve.

MEAN (μ)

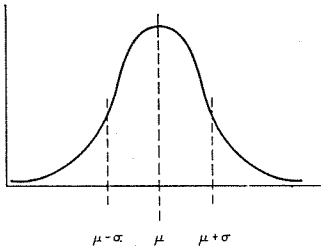


Most typical value of a symmetrical population, or the "center of gravity" value of a skewed population distribution curve.

AVERAGE ($\bar{x}$)

Average of sample values used to approximate the population mean.

STANDARD DEVIATION (σ)



A measure of the shape of the normal distribution curve. Area under $\mu \pm \sigma = 68\%$.

SAMPLE STANDARD DEVIATION (s)

Calculated from sample to approximate σ for the population.

STANDARD ERROR OF THE MEAN ($s_{\bar{x}}$)

A measure of how close the sample average $\bar{x}$ estimates the population mean, μ.

VARIANCE

σ^2, approximated by s^2

CONFIDENCE INTERVAL

A plus or minus value for $\bar{x}$ that corresponds to a probability of including the population mean, μ.

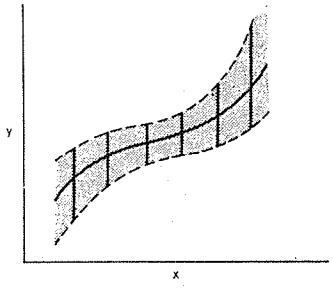
CONFIDENCE COEFFICIENT

The probability in per cent that the confidence interval for the sample average, $\bar{x}$, will include the population mean, μ.

LEVEL OF SIGNIFICANCE

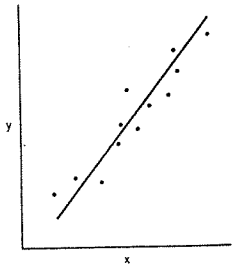
100 — Confidence coefficient.

CONFIDENCE BAND



An infinite series of confidence intervals for an equation with two or more variables.

REGRESSION ANALYSIS



Mathematically "fitting" a line to test points that relate two or more variables.

ACCURACY OF AN ANSWER IS EXPRESSED STATISTICALLY AS A CONFIDENCE INTERVAL

Confidence

The accuracy of an answer is expressed statistically as a confidence interval. In the example on gas mileage, no mention was made of the accuracy of the average mileage 14.80, or on the measure of the spread 2.06. If these two numbers came from test results on 10,000 cars rather than 100, the confidence in using them would be much greater.

The confidence interval for an answer can be different, even with a fixed number of tests, depending on the chance the engineer wants to take. This is characteristic of statistical analysis where, instead of black and white answers, all shades of gray are available, and the engineer picks his shade.

The accuracy of the average of a sample, $\bar{x}$, is usually the thing of interest. The way

TABLE 3 **Values of t for Student's t Distribution**

Degrees of Freedom	Percentile Points							
	0.75	0.90	0.95	0.975	0.99	0.995	0.999	0.9995
1	1.000	3.078	6.314	12.706	31.821	63.657	318.31	636.62
2	0.816	1.886	2.920	4.303	6.965	9.925	22.326	31.598
3	0.765	1.638	2.353	3.182	4.541	5.841	10.213	12.924
4	0.741	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.727	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.718	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.711	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.706	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.703	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.700	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.697	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.695	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.694	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.692	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.691	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.690	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.689	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.688	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.688	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.687	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.686	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.686	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.685	1.319	1.714	2.069	2.500	2.807	3.485	3.767
24	0.685	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.684	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.684	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.684	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.683	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.683	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.683	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.681	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.679	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	0.677	1.289	1.658	1.980	2.358	2.617	3.160	3.373
Infinity[a]	0.674	1.282	1.645	1.960	2.326	2.576	3.090	3.291

[a] $t = K$

a confidence interval, or measure of accuracy, of $\bar{x}$ is established is:

$$\bar{x} \pm K s_{\bar{x}}$$

where:

$s_{\bar{x}} = \frac{s}{\sqrt{N}}$, and is called the standard error of the mean.

For the gas mileage example on 100 cars, $s_{\bar{x}} = 2.06/\sqrt{100} = 0.206$; and if you want to be sure that the real mean, μ, of all cars, would fall in the confidence interval of $\bar{x}$ 95% of the time... K would be 1.96. The confidence interval for μ is then:

$$14.80 \pm 1.96(0.206)$$

or:

$$14.80 \pm 0.40 \text{ mpg}$$

This shows the double relation for the accuracy or confidence interval for the average $\bar{x}$. If the size of the sample, N, had been infinite, then μ would in fact be μ, and the length of the interval would be 0. If we wanted to be sure that the real population mean μ was in the confidence interval 99.9% of the time such a test was run, the value of K would be 3.291... and the interval would be correspondingly wider.

When reporting the average results of a series of tests, an accurate way to communicate this average to others is to say either:

14.80 ± 0.40 for a 95% confidence interval $(\bar{x} \pm K s_{\bar{x}})$

or:

14.80 ± 0.206 standard error of the mean $(\bar{x} \pm s_{\bar{x}})$.

STUDENT'S T DISTRIBUTION HELPS PROVIDE CONFIDENCE INTERVAL FOR SMALL SAMPLES

Confidence Interval for Small Samples

When the number of test runs is large, then the use of Table 2 to find K values for the confidence interval of the average, $\bar{x}$, is satisfactory. However, the percentile values for K change quite rapidly when the number of tests drops below 30. This is because Table 2 was calculated for an infinite population.

For small samples a modified table of percentiles is used, as shown in Table 3. This is the Student's t distribution. It equals Table 2 as N becomes infinite. This distribution was first used in an important statistical problem by WG Gossett, a chemist at the Guiness brewery in Dublin. Gossett published his results under the pen-name "Student" and the distribution has since been known as Student's t distribution.

The confidence interval for the 100 cars will change slightly if we use $\bar{x} \pm t s_{\bar{x}}$ rather than $\bar{x} + K s_{\bar{x}}$ since t from the table is 1.984 compared to the original K of 1.960. Had the original mileage test been made on only five cars, the t value would be 2.776, which gives about a 25% larger interval.

The t distribution in Table 3 is in its general form. This is why the term "degrees of freedom" is used rather than N. The term "degrees of freedom" is analogous to mechanical degrees of freedom. For the case of a single set of test values:

degrees of freedom = N - 1

Comparing Test Results

If the techniques of confidence intervals for averages are used, the results of two or more independent sets of tests can be compared, and a confidence interval set on the difference between the tests. For instance, the wear on two different types of brake drum lining materials could be compared by a laboratory dynamometer test. The problem is to tell which is better, by how much, and how confident you are in the answer.

For tests on drum material x versus material y we want to know the difference, d, or:

$$\bar{d} = \bar{x} - \bar{y}$$

The standard error for this difference would be:

$$s_{\bar{d}} = s_{\bar{x}} - s_{\bar{y}} = s\sqrt{\frac{1}{n_x} + \frac{1}{n_y}}$$

where:

n_x = Number of tests on material x
n_y = Number of tests on material y

s^2 can be expressed as:

$$s^2 = \frac{\sum_{i=1}^{n_x} (x_i - \bar{x})^2 + \sum_{i=1}^{n_y} (y_i - \bar{y})^2}{n_x + n_y - 2}$$

The s is a pooling of the distributions of the samples (s^2 often being called the "pooled variance"), while the $\sqrt{\frac{1}{n_x}+\frac{1}{n_y}}$ term compensates for the size of the samples similar to the formula $s_{\bar{x}} = s/\sqrt{N}$ in the section on "Confidence." The basic limitation is that both tests come from populations with similar standard deviations, that is $\sigma_x = \sigma_y$.

An example of two brake drum tests might be:

Test on Material x	Test on Material y
$x_1 = 13$	$y_1 = 15$
$x_2 = 17$	$y_2 = 17$
$x_3 = 15$	$y_3 = 23$
$x_4 = 11$	$y_4 = 18$
	$y_5 = 17$

For these test results:

$$\bar{x} = 14,\ \bar{y} = 18,\ \bar{d} = -4$$
$$\sum (x-\bar{x})^2 = 20,\ \sum (y-\bar{y})^2 = 36$$
$$s^2 = \frac{20+36}{4+5-2} = 8$$
$$s_{\bar{d}} = \sqrt{8}\sqrt{\frac{1}{4}+\frac{1}{5}} = 1.898$$

Since the number of samples is small, the t distribution in Table 3 is used. The degrees of freedom are 7, the sum of the individual degrees of freedom of each test sequence. For 95% confidence interval the 0.975 percentile is again used, giving t = 2.365. The confidence interval is then:

$$\bar{d} \pm t\, s_{\bar{d}}$$
$$-4 \pm 2.365\ (1.898)$$

or:

$$-4 \pm 4.4889$$

The interval is wide compared to the difference itself because of the small size of test sample. Since the interval includes zero, a hypothesis that the materials have the same wear characteristics would be supported.

This is a very common form of comparison between samples. The hypothesis $\mu_x = \mu_y$ is used to tell if today's production is continuing to meet performance standards, if two products from different sources are the same, and so forth. For this particular type of comparison the term usually used is "level of significance" (a), which is the same as (1 – confidence level). In the example, a = 0.05. Another way of saying the confidence interval includes zero is:

$$|t| > \left|\frac{\bar{d}}{s_{\bar{d}}}\right|$$

TABLE 4 **Experimental Results Consisting of 10 Pairs of Measurements of Engine Speed and Piston-Ring Wear**

Engine Speed (x), rpm/100	Piston-Ring Wear (y), mg/hr
8	1.1
10	0.9
11	1.2
12	1.4
14	1.3
17	1.7
20	1.6
22	1.9
23	2.1
26	2.0

REGRESSION ANALYSIS PLOTS SMOOTH LINE FOR SERIES OF TEST POINTS

Regression Analysis

Finding the equation that best fits experimental engineering relationships is the function of a regression analysis. For simple situations, this is the statistical equivalent of fairing a smooth line through a plot of test points, using the skill of the engineer's eyesight.

Complicated equations can be handled, involving power, trigonometric, logarithmic, and other terms, however, a computer is needed to attempt the more complex relationships. The computer actually treats each term as a linear relationship in the same way an engineer plots $x = y^3$ on log-log graph paper and gets a straight line of slope 3. So the principle of regression analysis can be illustrated by a linear analysis of two variables.

Test values for piston-ring wear at different engine speeds are shown in Table 4. The problem is to find the equation of the straight line that best fits these data. If the general equation of the line is:

$$y = a + bx$$

then the constants a and b are found from:

$$b = \frac{N\sum_{i=1}^{N} x_i y_i - \sum_{i=1}^{N} x_i \sum_{i=1}^{N} y_i}{N\sum_{i=1}^{N} x_i^2 - (\sum_{i=1}^{N} x_i)^2}$$

and:

$$a = \bar{y} - b\bar{x}$$

For the data in Table 4, the values of a and b are found from:

$$\sum_{i=1}^{N} x_i = 163 \qquad \sum_{i=1}^{N} x_i^2 = 3003$$

$$\sum_{i=1}^{N} y_i = 15.2 \qquad \sum_{i=1}^{N} y_i^2 = 24.58$$

$$\bar{x} = 16.3 \qquad \sum_{i=1}^{N} x_i y_i = 269$$

$$\bar{y} = 1.52 \qquad N = 10$$

and the regression coefficients are:

$$b = \frac{10(269) - 163(15.2)}{10(3003) - (163)^2} = 0.061$$

$$a = 1.52 - 0.061\ (16.3) = 0.520$$

The line and the plotted points are shown in Fig 4.

The confidence of the fit of this line is calculated much the same as before, only now a whole series of confidence intervals is needed. Intervals are computed for different values of engine speed (x), and then are connected to form a confidence band on either side of the line. The band is found from:

$$\bar{y}_x \pm t s_{yx} \sqrt{\frac{1}{N} + \frac{(x-\bar{x})^2}{(N-1)s_x^2}}$$

where:

$$s_{yx} = \sqrt{\frac{N-1}{N-2}(s_y^2 - b^2 s_x^2)}$$

The band is for the mean value of y_x. A wider band can be plotted for a single value of y, should one more test be run. This second band is:

$$\bar{y}_x \pm t\, s_{yx} \sqrt{1 + \frac{1}{N} + \frac{(x-\bar{x})^2}{(N-1)s_x^2}}$$

Both bands are shown in Fig 5 for a 95% confidence coefficient. This coefficient was found from the t distribution for an n-2 degree of freedom.

The calculations involved even for this simple set of tests are a prime reason why engineers don't develop confidence bands by pencil and paper methods. However, the same data put into a properly programed IBM 7094 computer produced a direct print-out of the graph itself and other pertinent data. This computer print-out is shown as Fig 6. With the computers doing the work, the engineer can now take advantage of statistical analysis as a more precise way to analyze data and make decisions.

(See Fig 6 on next page)

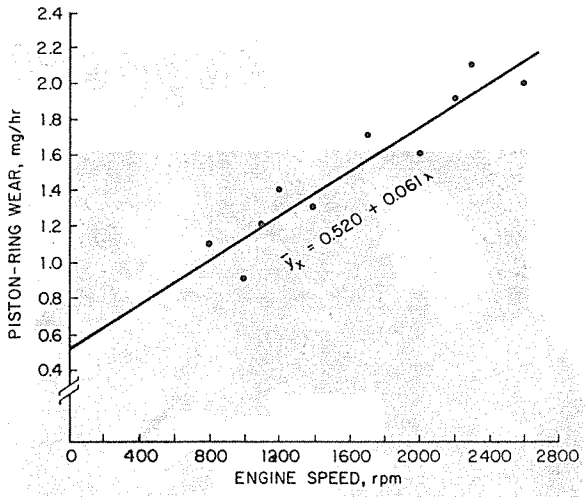


FIG. 4 Finding the equation that best fits experimental engineering relationships is the function of regression analysis. For simple situations, this is the statistical equivalent of fairing a smooth line through a plot of test points.

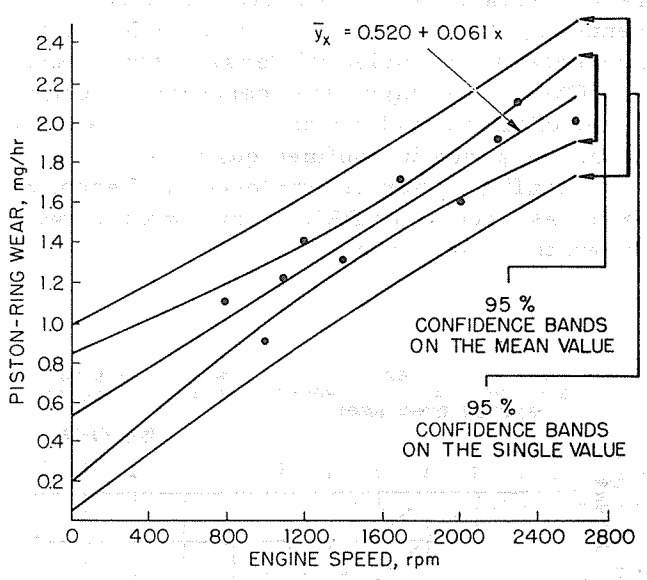


FIG. 5 Confidence intervals are computed for different values of X and then are connected to form a confidence band on either side of the line. A 95% confidence band is shown for both the mean value and single value.

Suggestion Awards

In June S sgt P Johnson received a Suggestion Award Certificate (and cheque) presented by Col A Mendelsohn, CD, in the presence of assembled officers and other ranks of DEME. His suggestion concerned changes in the EME Manual format for easier reading of foldout pages in confined quarters.

Staff Johnson is employed in Technical Services section of DEME; his name is well known to Bulletin readers.

S sgt DLF Leichnitz, AEEE, received a Suggestion Award Certificate and cheque presented by Maj Gen RP Rothschild in the presence of Col EC Mayhew, CD, Chief Supt AEEE.

S sgt Leichnitz designed a zipper dispenser for Wire, WD-1/TT.

S sgt Leichnitz is employed in the Electro-Mechanical Section, Materials and Packaging Division of the Army Equipment Engineering Establishment, Ottawa.

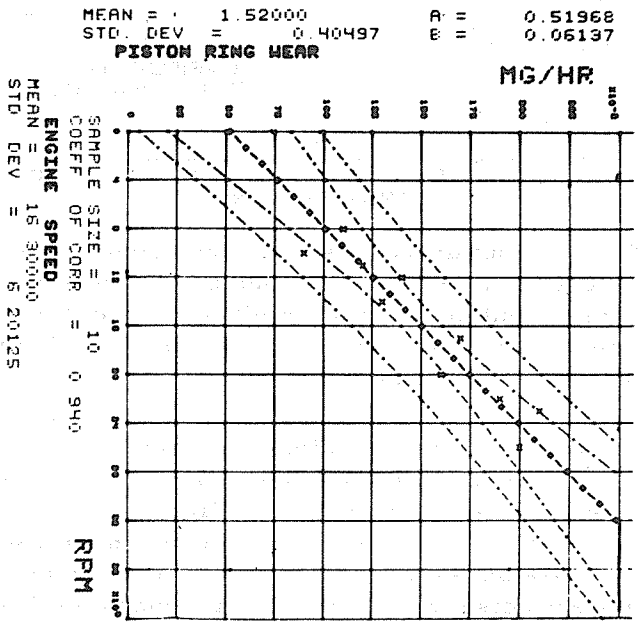


FIG. 6 Putting test data into a properly programmed computer results in a direct printout of the data plotted in FIG. 5. This enables the engineer to spend more time on analysis and decision-making – less on tedious plot work.

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SUGGESTIONS RECEIVED

The following suggestions have been submitted by military or civilian personnel in the Corps. Some will be adopted and many will be 'shot down' for various reasons. However, they are the best evidence that RCEME people are constantly using their heads.

These files were received in DEME during April, May and June. The publication of the particulars here does not in any way imply their acceptability.

Suggestor	Suggestion
S sgt GW Gibson 2 Coy RCEME	Modification to toboggans
Mr John M Plant 27 COD Wksp Br	A dummy clutch for Willys motors
S sgt GL Slade 6 Coy RCEME	Modification to Public Address Set AN/PIQ-501
Mr WEM Allender 27 COD Wksp Br	A method for removing broken screws from jeep starters
S sgt WE Skitteral 1 Tpt Hel Pl CJATC	Improvement in the testing and adjustment of binoculars periscopic
S sgt WC Ross 2 Fd Wksp	Locking Device on Radio Sets AN/PRC 509-510 to be used when the front panel is removed (See page)
Mr Edward Shultz 213 Wksp RCEME	A method for economically replacing the tip of a Wahl soldering gun
Mr Wilfred Robotham 27 COD Wksp Br	A locking device for 3/4 ton ambulance and utility

Sgt (Charlie) Larson became the first Army Sgt to be dined out at the RCAF Station, Uplands, Sgts' Mess. Sgt Larson is retiring after 23 years service and is shown being presented with an RCAF plaque at the Sgts' Mess by Capt JE Coates, OC 208 Wksp RCEME, on 7 May 65.

NO HOME AWAY FROM HOME

To be a member of a Sergeants' Mess is a privilege, and a pleasure, treasured by most senior NCOs and WOs. At one end of the scale, the drinks are cheaper there than anywhere else; at the other end of the scale, the Mess embodies all that is finest and most memorable as far as comradeship and congenial atmosphere in the army is concerned.

Recognition of the importance of the Mess in the lives of senior NCOs and WOs is indicated by the fact that most Messes present their retiring members with permanent honorary memberships. The retiring member receives a card which identifies him and ensures his welcome at any Sergeants' Mess, wherever he may be.

Unfortunately, not all senior NCOs and WOs retire from a Mess. There are many RCEME postings where no Mess exists. Even during their service, these men can enter Sergeants' Messes only as strangers, with nothing to identify them as senior NCOs or WOs, and on retirement it is often difficult for them to become honorary or associate members of a Mess. This situation seems unfair and unsatisfactory.

One way to correct it would be to make all RCEME other ranks, on promotion to senior NCO, honorary members of the RCEME School Mess, then issue each with a card, bearing his name, to this effect. On retirement these cards could be annotated, "Retired".

At minimal cost to the RCEME School Sergeants' Mess, this would provide all RCEME senior NCOs and WOs with a ready means of identification, and ensure that no one is denied the privileges attached to Mess membership by circumstances beyond his control.

Has anyone got a better suggestion?

INTEGRATION ??

the forgotten tradesmen?

By Cpl EA Le Fort, RCEME
Maintenance Troop, 2 RCHA

The RCEME Corps, being the largest "Service" Corps, has personnel located in almost every nook and cranny in Canada and overseas; in RCEME workshops, Inspection Teams, Militia employment, workshops in ME and NWE, etc, and lastly, "THE RCEME TRADESMEN ATTACHED TO FIELD UNITS". These last we will temporarily call "The Forgotten Tradesmen?" A question mark is deliberately inserted after the quotation for a specific purpose, and upon reading this article, one will realize its full significance.

In RCEME, the thought, the idea, the eventuality of a posting to a Field Unit, whether it be Artillery, Armoured or Infantry Corps, is to the average tradesman, the opposite of "A Thing of Beauty". You readers who have not experienced a prolonged tour with a 'field unit' probably find it a blessing that you have not had the experience. Of course you are curious as to what it would be like, but have no desire to physically find out.

The 'Old Vets' of the field units – to mention a few, George with the Garrys, Bowles with 3 RCHA, Barnhart with the Straths, Prettie with the Hussars, Rowsell with 2 RCHA,* and many others of honourable mention, including the writer, who have served ten years or more with field units – will read along with comprehension. It goes without saying that the above mentioned have at times wondered when their tradesmen counterparts were coming in to relieve them. Alas, relief seems only in the form of a posting to another field unit!

But is it really as black as most of us seem to paint it?

Generally speaking, during the first year or so one wonders, "What did D Pers have against me?", and for the next few, "Where the hell is my posting?"

After this, the days, weeks, months and years seem to slide by quickly and a strange realization of being categorized slowly dawns. One finds oneself set apart from the local workshop types, even though both in physical and employment aspects each is identical. Suddenly there has dawned a new image, the image of 'Contentment Within The Unit'.

This in itself is difficult at first to accept or admit, even to oneself. No one is supposed to like or allow himself to be contented in a field unit. No one, that is, except the Old Vets who have ceased to moan and groan, and talk little any more of postings. Each has been moulded mentally into the unit he serves.

Whether this has occurred voluntarily or not, it is a phenomenon which only years can bring about. At this stage, regimental or battalion policies and their constant changes are taken in stride. Each realizes that he is proud of the unit he serves and is respectful of its traditions.

What really brings about this phenomenon? An admission of defeat? No! A sign of getting old? Definitely not! D Pers has finally done it – we've been forgotten? No again. The answer is simple. The 'soldier' which lurks always in the background of each RCEME tradesman has made its existence felt.

Of course we Old Vets are different than the local workshop types, for we not only have our own corps traditions to be proud of, but also those of the unit we serve. The Red Patch is our badge of recognition, and who could miss the whitened chevrons and trades badges of RCEME personnel attached to artillery units?

In reality we need no recognition. Walking shoulder to shoulder with the best of soldiers we are able to carry out our responsibilities as tradesmen and still have the proud distinction of being able to soldier as well as the best. With heads up and shoulders back, we are, (if I may quote Cassius) the 'greatest".

Yet, next year you may see us among the local workshop types and you may wonder what's

(continued on next page)

* WO 1 LJ George
Ssgt JA Bowles
Ssgt JB Barnhart
Gnr JR Prettie
Sgt LS Rowsell

LETTERS

Sir:

This letter refers to RCEME Technical Bulletin Apr 65, Vol 10, No 2, pages 20 to 22 inclusive (Equipment Failures).

The card system referred to in paragraph 14 (a pre-printed post card) on C-42 Radio Set failures was suggested by me in 1960 at a conference held at 202 Base Workshop which was held primarily to prove production and time study methods for the installation of C-42 communication equipments in AFVs.

In attendance at the conference were officers, WOs and NCOs, naturally a general discussion was held. At this time the suggestion was made by me (to include all technical equipments) as an expedient especially with new equipments as they were introduced into the service. No thought was given at that time for a suggestion award. WO 1 L Hurd now employed at MTS (Montreal) I am sure will confirm this suggestion as he was employed on this project and present at the conference.

CE Taylor WO 2

Editor's Note:

Your letter raises several points which may be of interest to other Corps personnel.

First point is that the conference you refer to was probably called for the purpose of reaching some solution and therefore your suggestion was in the line of duty. It is not therefore eligible for an award. Second point is that if a suggestion has been implemented for a period of three months, it is not eligible for an award.

However, it is your prerogative – if you wish – to submit your original suggestion for acceptance or rejection by the Suggestion Award Committee. In this way you will get the official decision.

(TRADESMEN continued)

so different about us? A 'thoroughbred out to pasture, after years of great moments' attitude hangs over our heads. We've been there!

The "Forgotten Tradesmen?" is only the title of this article, not a reality and now, finally, the question marks may be removed.

Editor's Note: The following comments from the CO 2RCHA are indicative of the esteem which a tradesman with the proper attitude can earn from his unit.

"After reading the article one has the impression that Cpl Le Fort wrote it 'with tongue in cheek' and yet with a definite purpose in mind. It contains in essence one of the prime requisites of a good military tradesman; the ability to adapt to varied regimental atmospheres in such a manner as to leave technical efficiency unimpaired. This should be the aim of every conscientious tradesman from the craftsman on up.

"It is obvious that Cpl Le Fort is one of the type which he so aptly describes in his article."

DEME adds his approbation.

Sir:

I thoroughly enjoy the RCEME Technical Bulletin and consider it an excellent channel of communication.

In the article "Those People In Ottawa" by S sgt P Johnson there is a statement "A continuous flow of information to Ottawa is essential to help keep RCEME on top of the repair job." How about the flow of information from Ottawa to the craftsman on the bench? This is also essential to help keep RCEME on top of the repair job.

Your new policy as outlined would indicate that an attempt is being made to increase the two-way flow of information. In this respect someone has to ask a question to get an answer. To promote and stimulate this action how about the editorial staff asking questions; for instance, "Do you know that a CASM parts list for the Illuminator-Viewer Infrared AN/TAX 501 was released for issue in April 65? and that a parts list for the Generator Set PU 5020/TAX 501 will be released by the end of May 65?

There are many items such as this which we at Ottawa take for granted but which are very interesting to the technician on the bench.

Once again I wish to congratulate you on your publication; you are doing an excellent job and keep up the good work.

RH Purton, Capt
DCER 3B2

TECHNICAL NOTES

M113A1 and M577A1 APC Crew Servicing Pamphlets

Crew Servicing Pamphlets for the Armoured Personnel Carrier M113A1 and Carrier Command Post Light Tracked M577A1 are available in English and French versions. Automatic issues have been made to all user units. Additional copies may be obtained by submitting demands through normal channels. Cataloguing particulars are as follows:

7610-21-116-5321 Manual Technical Carrier Personnel Full Tracked, Armoured M113A1 CDN and Carrier Command Post Light Tracked M577A1 CDN Crew Servicing (English)

or

7610-21-117-0242 Manual Technical Carrier Personnel Full Tracked, Armoured M113A1 CDN and Carrier Command Post Light Tracked or 577A1 CDN Crew Servicing (French).

Brochure D'entretien a L'intention de L'équipage M113A1 et M577A1

Les Brochures D'entretien à L'intention de L'équipage pour La Chenillette Blindée de Transport de Troupe, M113A1, Canadienne et La Chenillette Blindée, Légère de Poste de Commandement M577A1, Canadienne sont disponibles en anglais et en français. Celles-ci ont été distribués automatiquement à toutes les unités usagères; cependant, on peut en obtenir des exemplaires en présentant des demandes par les voies ordinaires. Les détails de catalogue sont les suivants:

7610-21-117-0242 Manual Technical Carrier Personnel Full Tracked Armoured M113A1 CDN and Carrier Command Post Light Tracked M577A1 CDN Crew Servicing (French).

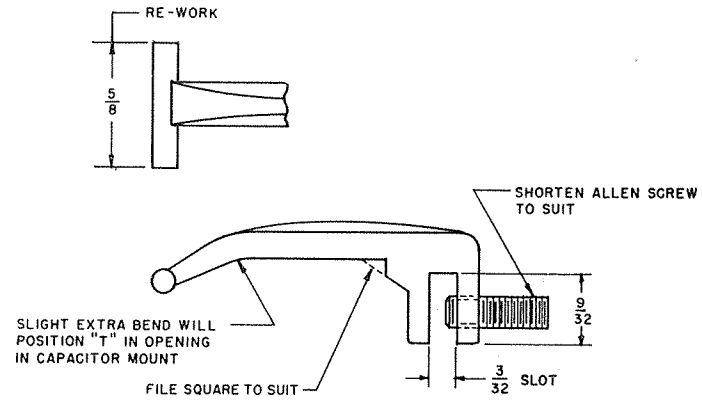
ou

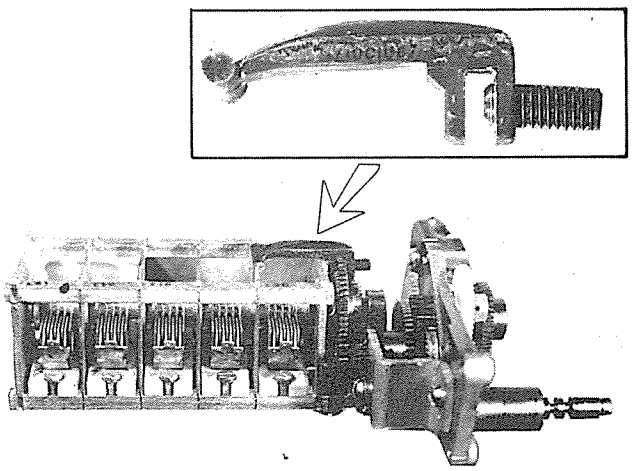
7610-21-116-5321 Manual Technical Carrier Personnel Full Tracked, Armoured M113A1 CDN and Carrier Command Post Light Tracked M577A1 CDN Crew Servicing (English).

NOTE – Issue 2 of the above Crew Servicing Pamphlet (English version) is now at the printers and should be issued to units early in Aug.

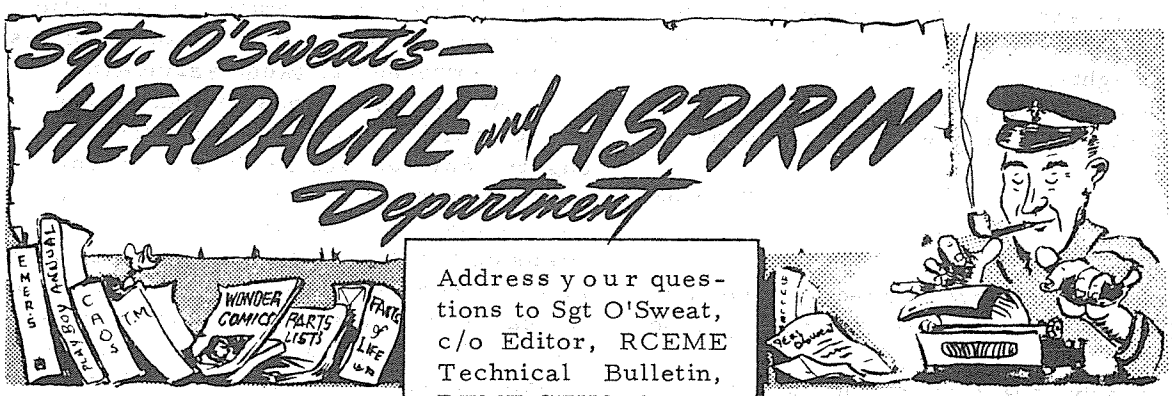
RADIO SETS AN/PRC-509/510

S sgt Ross of 2 Coy has suggested a time-saving repair technique that may be used when removing front panel components. This technique employs a modified fastener (CPRC-26) to secure the tuning capacitor in a pre-aligned position. Fastener, Electrical Panel (5325-21-108-9373) a CPRC-26 item, is shown as modified and used in our illustrations. These views are considered self-explanatory and the implementation of this suggestion will depend on the ingenuity of the local technicians.





Some 98 per cent of industrial accidents are preventable says Travelers Insurance Co, New York. Unsafe employee practices account for 88 per cent of the mishaps as opposed to unsafe plant conditions which total only 10 per cent.


Sgt. O'Sweat's—
HEADACHE and ASPIRIN
Department
WONDER COMICS
PARTS LISTS
Address your questions to Sgt O'Sweat, c/o Editor, RCEME Technical Bulletin, DEME CFHQ Ottawa

Dear Sgt O'Sweat:

Cribbed from the Health of Animals Branch News Letter which stole it from The Financial Post which was quoting "Shell Aviation News" which lifted it from "The Majic Carpet":

"As everyone knows, an executive has practically nothing to do except to decide what is to be done, to tell somebody to do it, to listen to reasons why it should not be done, why it should be done by somebody else or why it should be done differently.

"To follow up to see if the thing has been done, to discover that it has not, to listen to excuses from the person who should have done it; to follow up again to see if the thing has been done incorrectly. To point out how it should have been done, to conclude that as long as it has been done, it may as well be left as it is; to wonder if it is not time to get rid of a person who can't do a thing right.

"To reflect how much better and simpler the thing would have been if one had done it oneself in the first place.

"To reflect (sadly) that one could have done it right in 20 minutes and, as things turned out, one has had to spend two days to find out why it has taken three weeks for somebody else to do it wrong."

GHC

PS: You too can steal it!

Dear Sgt O'Sweat,

We have an Instrument Mod Instruction S147 Mod Instr 4 that details the fitting of vinylite washers to the hinge assembly of Binoculars for a smoother hinge movement.

The problem is that the modification parts are not available (not to mention the part numbers in the instruction have no brought up to date).

This is a good Mod and we would be able to carry it out but we are stumped help you can give us would be welcome.

Ssg

Dear Ssgt RCB:

Washer 6V/CGB 3382 has been as new number 5310-21-107-8528 and 6V 3380 number 5310-21-107-8530. I estab this by looking in an Ordnance publication the Master Parts Catalogue (MPC). Your parts stores section should have a copy MPC. If not, their next higher supply a will have it.

The Ordnance people here in Ottav me the SPSS should have accepted your d with the old number, have cross referen with the new number and when giving y parts should have told you the new nu Incidentally, although stocks are low just there are still some in the depot.

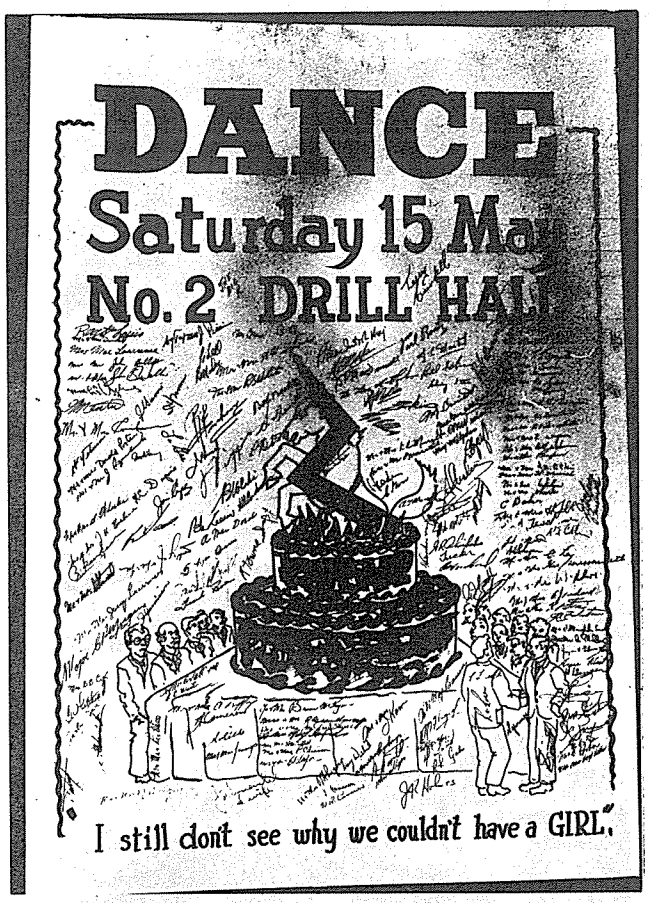
The EME Manual is not an official catalogue and therefore instructions a amended at every change of catalogue nu These are only brought up to date on n rewrite or amendment of the instruction

Sgt O'

Dear Sgt O'Sweat:

We are having some trouble wit PP-5156/G Power Supply. When this su connected to the regulating transformer, amps or more is drawn from the supply lights, which are also connected to the t former, flicker as if 25 cycle power was used.

In our shop the regulating transfo



Poster for 2 Field Workshop, Camp Petawawa, 21st Birthday Party, signed by all the guests.

Birthday in Soest

On 14 May 65 a RCEME Birthday Ball was held for the RCEME Units in the Werl-Soest Area, excluding the 4 Fd Wksp. RCEME personnel in the following units were in attendance:

1 RCR	B Coy 3 R22eR
1 PPCLI	1 Tpt Coy
2 RHC	4 OFP
Recce Sqn FGH	4 Pro Pl
4 Fd Sqn	Bde HQ incl DADEME
4 Sig Sqn	and staff

The party was held at the Hubertussaal Soest, Germany, and over 300 people were in attendance. Music was provided by a Canadian band made up from RCEME soldiers from 4 Field Workshop. A fried chicken dinner was provided at midnight and festivities continued until 0300 hrs.

Col Mendelsohn was in attendance till 2230 hrs and before leaving officially cut the Birthday Cake. A photograph of both the cake and the cutting ceremony is included. Unfortunately all units could not be represented in the picture due to the numbers. The cake was prepared by the RCASC staff of 1 RCR.

From l to r: Cfn Wieringa, 4 Fd Sqn; Col Mendelsohn (with back to picture), Major Yarymowich (behind Col Mendelsohn almost out of sight), Sgt Kennedy, 1 Tpt Coy; Cpl Peeler, 4 Sig Sqn; Cpl Gauvin, B Coy 3R22eR; WO2 Greenshields, Bde HQ; Cpl Gebicki, 4 Pro Pl; Cfn Woodworth, 2 RHC.

Cutting the Birthday Cake

Birthday in Cyprus

Greetings to all members of the Corps of Royal Canadian Electrical and Mechanical Engineers from RCEME personnel serving with the United Nations in Cyprus.

On 14 May, by way of celebrating our 21st birthday, the 40 men who are here at the present time took the day off and joined in a bit of fun for a change.

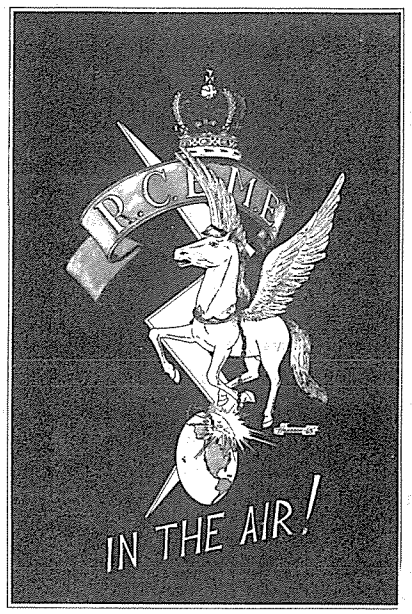
Festivities commenced in the morning with a softball game on the American Club diamond between the RCD Recce Sqn LAD and the Canadian Contingent RCEME Detachment. They were joined in the afternoon by the 1 QOR Maintenance Platoon, and the round-robin series ended with the RCDs as acknowledged RCEME champions for Cyprus (for the present time at least).

At 5 pm, sports were adjourned and the party moved out to the Arkadi Restaurant for an excellent buffet supper laid on by our RCASC staff. Dinner was followed by a local Greek entertainment group which provided a fitting climax to the day's activities.

It was a day to be long remembered, especially by those who either broke a leg or a finger, or were just plain stiff after all that muscular activity.

Back row: Cpl W Pankew, Cfn MA Burgess, Cpl LG Garbet, Cfn J Mallon, Cfn WH Madore, Cpl GA Waldbrook, Cfn N Henniger, Cfn PBS Stephen, Lcpl ER Parent, Cfn JMR Dufour, Cfn NW Herriott, Cfn WH Annand, Cfn DJ Langevin. Center row: Sgt GH Wall, Sgt WG Sabko, Cfn JE Fawson, WO2 FA Lewis, Cpl KR Con, Cfn PE Geggie, Sgt WG Drouin, Cpl BA Holden, Cfn JA McInnes, Cfn O Carr, Sgt NE Matheson, S sgt RM McDougall, Cpl GLV Watkins, WO2 EB Wild. Front row: Cpl JD Dunsmore, Cfn DK Fader, Cfn RB Webster, Cpl JJ Wood, Maj CA Miller, Cfn JHP Ally, Cfn RJ Taylor, Cfn EE Beirnes, S sgt RL Mercer, Cpl RJ Roenspies. They are in 3 units: RCEME Det, 1 QOR and RCD.

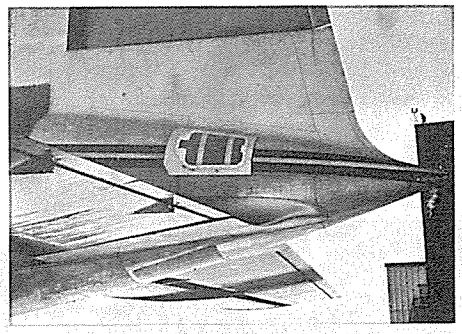
RCEME IN THE AIR

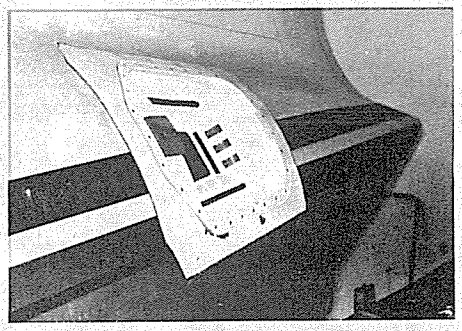


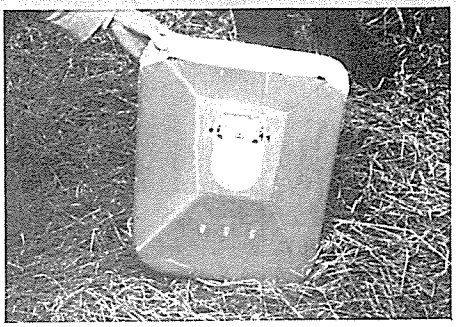
Contributed by Ssgt JE Knight RCEME
CFHQ T/L Flight

CRASH POSITION INDICATOR
ACCIDENT DATA RECORDER

The captain had only time to transmit "Mayday, Mayday"
—and then silence.
The large airliner had crashed into the sea
and sank to a depth from which it could never be recovered;
there were no survivors.
What an advantage it would be
to have a device which would survive the crash,
transmit a radio signal,
and record all that happened on the airliner
for the last thirty minutes of flight!
A Canadian company has
developed just such a device.







In a recent five-year period, there were 197 searches for downed aircraft in Canada. Over 25,000 aircraft hours were expended and 17 of the 197 aircraft were never found. One hundred and forty-five persons are either dead or still missing. In the calendar year 1961, the Civil Air Patrol in the USA searched for a total of 1,374 persons on board 719 lost aircraft. Of these 838 were found alive, 405 were found dead, and 131 people were never located at all. This shocking testimony proves the need for some device to assist in locating missing aircraft.

Also, there are many aircraft crashes each year where there is no difficulty in locating the scene of the crash but since the break-up is so catastrophic it is impossible to determine the reason for the crash. TCA's DC8 which crashed near Montreal last November killing all 118 persons on board is an example of this. If the reason for a crash goes undetermined, corrective action to prevent future occurrences cannot be taken. Consequently the need is

established for not only a device which will indicate the scene but also one which will survive the crash and tell what went wrong.

In response to this need a Canadian firm, has developed, after considerable research, a combined Crash Position Indicator - Accident Data Recorder (CPI/ADR). The main difficulty in designing such a device is to develop one which will survive a crash when the aircraft is almost totally destroyed. The solution decided upon employs the "tumbling aerofoil" concept. A very light transmitter and the tape of a data recorder were packaged in thick tough plastic foam forming a solid mass and shaped into a high lift aerofoil. Such a tumbling aerofoil fulfills several functions simultaneously. It serves as a case for the radio transmitter, antenna, batteries and tape which are embedded in the plastic foam. By suitable placement of the centre of gravity, the device can be made to rotate rapidly after release, and thus slow down quickly so that a safe landing speed is reached in a very short distance. Tests have shown that it will slow down from 300 kts to 26 mph in 50 feet. In addition it generates an average lift which curves it away from the wreck. The blanket of plastic foam on all sides protects the components inside from crushing on landing and also acts as an excellent thermal insulator making it possible to keep the batteries above ambient temperature. By keeping the mass loading down to about two pounds per square foot, the device not only performs well in air, but can land safely and operate on any type of terrain, snow, or water. It floats 85 per cent above water and so maintains its internal antenna clear to radiate. It is approximately 20 inches square, 8 inches deep and weighs 4.75 pounds. The shape can be varied so that it will fit the original contours of the aircraft. Thus when fitted to an aircraft it does not cause any additional aerodynamic drag.

The unit is normally flush-mounted in the tail area of an aircraft and is held in position by a permanent magnet with a bucking coil release. The bucking coil is connected in series with a number of detectors, such as inertial switches, frangible switches, fire detectors, etc. This electrical circuit carries a 10 milliamp circulating current which, if broken as a result of a crash, operates the bucking coil and allows the aerofoil to be ejected into the airstream by means of a spring. The circuit has a very small time constant so that release occurs within milliseconds of detection. If an aircraft were to fly into a mountain at high speed, the unit would be released by the time the nose of the aircraft had crumpled back as far as the cockpit.

The Crash Position Indicator consists of a very lightweight transmitter crystal controlled to operate on 243 mcs. Assuming the altitude of the search aircraft is adequate it has a range of 30 to 50 miles. The unit is powered by a nickel cadmium battery and will operate about 100 hours pulsed transmission, or 50 hours CW. The battery is constantly trickle-charged from the aircraft source until the time of release. Once released the beacon automatically starts transmitting.

The Accident Data Recorder is part of the aircraft and stays with it in the event of a crash. Only the tape is housed in the tumbling aerofoil. The recorder operates any time power is applied to the aircraft and records all radio or interphone transmissions made or received by the pilot. This occupies one channel of the four-channel tape. Each of the other channels can measure up to 32 parameters making a total of 96 in all. The parameters measured vary according to the type of aircraft but include such things as altitude, speed, attitude, acceleration, rpm, engine temperatures and pressures, etc. The tape holds only 30 minutes of information but is continuous so that the last 30 minutes of flight is always on the tape regardless of the time airborne. In the event of an aircraft power failure, the recorder operates for 20 minutes from its own power source. Thus if a CPI/ADR fitted aircraft should crash, not only will locating the scene be greatly facilitated, but also the last 30 minutes of flight will be accurately recorded so that the reason for the crash can be determined.

The RCAF is currently planning to fit all Yukon aircraft with the CPI/ADR and flight trials have already been completed. It is hoped that eventually all high-performance RCAF aircraft will be so equipped. When a new aircraft first comes into service there is always a period of time until all the "bugs" are eliminated. A CPI/ADR should prove a valuable asset in the Tutor program. The Crash Position Indicator is also available without the Data Recorder at considerably less expense. This could be a great boon in locating small civilian aircraft that get lost and crash far from their intended flight path.

No aircrew member looks forward to the day when he may become the victim of an aircraft crash, but it would be comforting for him to know that his chances of survival would be greatly increased by a small radio transmitter that could withstand the crash and lead rescue agencies to him in the shortest possible time. Even if there are no survivors, the recorder tape will most likely reveal what went wrong so that action can be taken to prevent future accidents of the same nature.

-Flight Comment

Editor's Note The device is going into the L 182 and a study is underway for the purpose of putting one in every aircraft, according to Director Aerospace Engineering.

who's where

LOCATION OF RCEME STAFF SERGEANTS

As of 15 Jun 65

Abell	GW	RCEME School
Alexander	LW	4 RCHA
Alexander	RJ	EBS Bn
Allen	FT	HQ BC Area
Allen	T	13 Coy
Allen	WH	2 Fd Wksp
Almdale	JT	CJATC
Anderson	DE	AEEE
Anderson	GA	1 Fd Wksp
Anglin	P	202 Base Wksp
Anyan	SG	2 Coy
Armour	GD	CADEE
Arnott	DA	10 Coy
Arsenault	JMC	5 Coy
Arsenault	RP	2 Fd Wksp
Asham	OM	1 Coy
Atkin	RJ	CJATC
Atkins	JW	4 Fd Wksp
Annas	OE	CJATC
Aubuchon	R	1R22R
Bailey	L	4 Coy
Baillargeon	H	5 Coy
Barber	TW	4 RCHA
Barker	AC	56 TPT
Barnes	WG	CJATC
Barnhart	JB	11 Coy
Batty	DJ	6 Coy
Bennett	BW	DEME
Berdan	WE	HQ Alta Area
Best	WA	DEME
Bezanson	RT	7 Coy
Billinghurst	FJ	DEME
Bing	J	202 Base Wksp
Bingham	HC	13 Coy
Birdsell	DG	4 Fd Wksp
Bishop	JA	EBS Bn
Blais	R	4 Coy
Blanchard	JM	1 Fd Sqn RCE
Blank	EW	1 TPT Hel Pl
Bodine	WC	11 Coy
Bothner	AD	13 Coy
Boudreau	JIF	11 Coy
Boudreau	M	HQ Que Comd
Boutillier	AE	RCEME School
Bowles	JA	202 Base Wksp
Boyce	EF	3 Coy
Boyte	JC	10 Coy
Brimmage	RC	2 Fd Wksp
Bravdbent	WH	202 Base Wksp
Browne	WD	AEEE
Burgess	DR	RCEME School
Burleigh	JBM	8 Coy
Burnby	L	13 Coy
Burnet	RL	13 Coy
Cameron	RJ	8 Coy
Campbell	AM	3 RCHA
Campbell	HE	8 Coy
Campbell	MA	HQ CBUE
Cannon	NB	4 Fd Wksp
Carr	AJT	1 Coy
Cederberg	RA	RCEME School
Champagne	JP	5 Coy
Chandler	RL	CADEE
Charbonneau	JJL	HQ Que Comd
Clarey	DJ	RCEME School
Clark	J	202 Base Wksp
Clark	KD	202 Base Wksp
Clark	WJ	1 TPT Hel Pl
Clarke	TJ	1 RCR
Cleveland	HW	3 Coy
Clinton	WFD	1 Fd Wksp
Cochrane	GG	202 Base Wksp
Colborne	EK	RCEME School
Colbridge	DW	202 Base Wksp
Cole	GN	4 RCHA
Cole	JC	14 Coy
Cooper	KRH	FHG
Cote	L	5 Coy
Crane	JA	EASE Sig
Crawford	GHL	5 Coy
Cronin	RM	3 Coy
Crosby	RD	202 Base Wksp
Cruichshank	GJ	202 Base Wksp
Culling	JT	1 Sig Regt
Cummings	D	14 Coy
Currie	WR	4 Fd Wksp
Cushing	JE	27 COD
Darton	FA	27 COD

Davidson	HJ	RCEME School
Davis	JJ	UNEF Middle East
Daye	RE	1 TPT Hel Pl
Desjardins	JGR	202 Base Wksp
Dewson	JE	CADEE
Dormer	GH	UNEF Middle East
Doubleday	EG	RCEME School
Downes	JD	4 Coy
Ducasse	C	5 Coy
Duffy	RL	UNEF Middle East
Dunham	RD	202 Base Wksp
Dypolt	EJ	DID
Edwards	GH	LdSH
Einarson	GE	1 Fd Wksp
Eldridge	HE	7 Coy
Embury	RE	1 Fd Wksp
Encarnacion	RH	1 Fd Wksp
Endall	RE	2 RCHA
Fagan	WH	HQ Eastern Ont Area
Farnsworth	FA	AEEE
Farrants	MJ	11 Coy
Faulkner	EM	UNEF Middle East
Finsten	LR	HQ Sask Area
Fitzgerald	EJ	1 Fd Wksp
Forbes	WR	RCEME School
Foreman	M	202 Base Wksp
Foster	JT	3 Coy
Freeman	JI	2 Coy
Frenette	N	Alert
Fuller	AB	CBUE
Funk	P	1 RCR
Fyke	JH	EBS Bn
Gattrell	CA	4 Fd Wksp
Gibbs	E	13 Coy
Gibson	GW	2 Coy
Gillies	DJ	4 Coy
Gilbrie	LG	11 Coy
Glover	W	RCEME School
Goodfellow	JJA	202 Base Wksp
Goodman	EET	DEME
Gordon	FC	RCEME School
Gork	KD	10 Coy
Gourlay	KJ	14 Coy
Green	ER	202 Base Wksp
Gross	EJ	3 Coy
Guillemette	A	10 Coy
Gumbley	HG	FGH
Haas	DF	4 Fd Wksp
Hackett	GK	202 Base Wksp
Hancox	WR	RCD
Harding	WE	RCEME School
Harlow	AL	RCD
Harris	FJ	13 Coy
Hartle	WM	13 Coy
Hawkins	AE	EBS Bn
Hayden	SV	Central Ont 'I' Staff
Heichert	RR	FGH Recce Sqn
Hein	GR	RCEME School
Hemley	HWE	10 Coy
Henderson	WR	7 Coy
Hercun	WJ	4 Fd Sqn RCE
Hetherington	LG	RCEME School
Hewitt	JS	13 Coy
Heximer	AM	2 Coy
Hicks	IH	EBS Bn
Hightower	WH	LdSH (RC)
Hill	FW	RCEME School
Holder	AE	4 Fd Wksp
Hollebone	JL	13 Coy
Hoskin	VE	11 Coy
Hudson	PS	RCEME School
Hudson	IF	10 Coy
Humble	IES	7 Coy
Humphries	GD	4 Fd Wksp
Hunt	AK	2 Coy
Ion	RJ	EASE
Irvine	HN	13 Coy
Jackson	RWE	Central Ont 'I' Staff
Jahraus	H	1 Fd Wksp
Jermey	FW	4 Coy
Jodain	DJC	6 Coy
Johnson	P	DEME
Kerr	RG	RCEME School
Kilfoyle	WC	3 Coy
Kimber	JB	AEEE
King	RE	RCEME School
King	WG	8 Coy
Klossen	J	10 Coy
Knight	JE	CFHQ T/L
Knott	WH	ASE RCE
Koethe	PJ	1 Fd Wksp
Kohler	WJ	3 Coy
Kroecker	IJ	EBS Bn
Kennet	AE	1 CBOU
Lacelle	JAD	HQ E Que Area
Lafleur	JM	RCSA
Laing	JT	27 COD
Lambert	HJ	RCEME School
Laramie	DA	EBS Bn
Laruelle	G	202 Base Wksp
Lascelles	JA	5 Coy
Lawless	RG	FGH
Leach	WJ	14 Coy
Leblanc	RJ	25 COD
Ledgerwood	WA	HQ C Ont Area
Lefebvre	R	202 Base Wksp
Leichnitz	DLF	AEEE
Leslie	WG	RCD

Linge	HL	1 Fd Wksp
Linzmayer	F	13 Coy
Lloyd	RA	10 Coy
Lockett	AE	1 Fd Wksp
Lovell	AH	LdSH
Lusk	NEP	CADEE
MacDonald	JA	EBS Bn
MacDonald	DWF	1 Fd Wksp
MacDonald	WJ	1 Loc Bty
MacKay	AH	2 Coy
MacNeill	ER	1 RCR
MacNeill	WC	1 RCHA
Malmsten	RE	Recce Sqn 8 CH
Manktelow	WO	8 Coy
Mansfield	LA	UNEF Middle East
Marriott	WG	RCEME School
Martin	GH	13 Coy
Martineau	RVJ	HQ Que Comd
Massey	JL	UNEF Middle East
Masson	PH	AEEE
McClafferty	CE	RCAC School
McClafferty	LM	RCEME School
McDougall	RM	RCD
McDowell	FJ	202 Base Wksp
McGrath	HFJ	8 Coy
McIntosh	RC	14 Coy
McIntyre	G	1 Loc Bty
McKee	AG	6 Coy
McKnight	CWB	10 Coy
McLean	GD	2 Coy
McLeod	AS	2 PPCLI
McLeod	LW	11 Coy
McPhee	LW	2 Fd Wksp
Meints	RC	3 Fd Sqn RCE
Meisner	GG	RCAC School
Mercer	RL	7 Coy
Meroni	M	RCEME School
Miller	AR	2 Fd Wksp
Miller	WPG	11 Coy
Mombourquette	JS	4 Fd Wksp
Montgomery	DC	14 Coy
Mooney	CJO	CJATC
Moore	J	2 RCHA
Morden	SD	4 Fd Wksp
Moreau	G	2 RCHA
Morton	R	202 Base Wksp
Munday	KR	CJATC
Murphy	JD	EBS Bn
Myra	EA	6 Coy
Neufeldt	EH	13 Coy
Nicol	RJ	202 Base Wksp
Noel	H	DEME
Nolan	AR	1 Fd Wksp
Noonward	DC	202 Base Wksp
Norman	MW	7 Coy
Nunn	GJC	3 Coy
O'Neill	JP	3 Coy
Owen	RS	RCEME School
Palmer	JH	13 Coy
Palmer	MP	1 RCHA
Paradis	LA	2 R22R
Parsons	FG	202 Base Wksp
Patrick	KG	2 Fd Sqn
Patterson	FA	4 Fd Wksp
Patterson	MV	HQ BC Area
Payson	GS	4 TPT
Phillips	GL	2 Cdn Gds
Pilote	GCR	UNEF Middle East
Pineault	E	5 Coy
Piper	MW	27 COD
Porteous	PR	2 Fd Wksp
Porter	E	CADEE
Powell	ES	27 COD
Preston	WJ	3 RCHA
Putman	WG	11 Coy
Raby	KO	AEEE
Randall	DE	27 COD
Reid	HC	4 Coy
Reid	JA	1 Fd Wksp
Rice	EA	EBS Bn
Rich	EF	3 Coy
Ridlington	AR	5 Coy
Ripley	FA	1 C MED
Robertson	JB	LdSH
Robinson	RN	13 Coy
Rodgers	C	13 Coy
Rogers	CP	6 Coy
Rose	NE	RCD
Ross	DA	10 Coy
Ross	RC	UNEF Middle East
Ross	WC	2 Fd Wksp
Rostek	WF	1 Loc Bty
Roy	AJ	27 COD
Ryder	EC	2 Coy
Sales	RS	2 TPT
Saunders	RB	RCEME School
Saunders	WJ	13 Coy
Schell	SE	1 Fd Wksp
Schluster	RF	7 Coy
Schnarr	AE	3 Coy
Schussler	WD	UNEF Middle East
Scott	JM	202 Base Wksp
Sears	D	EBS Bn
Serle	JD	RCEME School
Shepherd	KI	RCEME School
Shultz	AD	3 Coy
Sibley	MH	13 Coy
Siefert	JH	2 RCHA

Simpson	FA	2 Fd Wksp
Sitter	MC	13 Coy
Skitteral	WE	1 TPT Hel Pl
Slade	GL	6 Coy
Smale	WF	2 TPT
Smith	BW	CBUE Incr "A"
Smith	DB	1 TPT
Smith	JW	1 PPCLI
Snell	JC	3 Coy
Snider	PL	AEEE
Snyder	WO	EBS Bn
Spragg	WH	7 Coy
St John	DA	7 Coy RCASC
Stables	JJ	CJATC
Steele	PA	FGH
Stevens	DW	4 Fd Wksp
Steward	DF	2 Fd Wksp
Steward	GW	202 Base Wksp
Stewart	A	13 Coy
Stewart	JR	HQ CBUE
Stoney	ME	FGH
Stooke	RG	1 SSM Bty
Stover	RE	3 Coy
Stubbe	W	2 SSM Bty
Sturley	KM	CJATC
Sudds	WA	202 Base Wksp
Suley	SDW	1 TPT Hel Pl
Swan	JM	13 Coy
Swann	EL	202 Base Wksp
Swedberg	GO	FGH
Swift	DW	7 Coy
Szekeres	JJ	RCEME School
Taylor	PH	AEEE
Tetlock	LS	2 Fd Wksp
Thibault	CE	RCEME School
Thibert	JED	14 Coy
Thompson	GF	14 Coy
Thoresen	RE	13 Coy
Thorne	KA	CBUE
Totten	CR	RCD
Townson	CB	10 Coy
Tryon	ER	9 TPT Coy
Turcotte	GJ	RCEME School
Turner	AG	RCEME School
Vipond	CD	CADEE
Wacey	WC	10 Coy
Walker	BG	13 Coy
Walker	LH	4 Fd Wksp
Wallace	AE	13 Coy
Wardle	JS	2 OOR of C
Watson	MTG	3 Coy
Watson	RK	10 Coy
Waugh	CH	13 Coy
Weekes	WL	EBS Bn
Wendorf	BH	EBS Bn
Westergard	O	1 Fd Wksp
Wheatley	HJ	10 Coy
White	DR	1 RCHA
White	TD	2 Coy
Wight	AH	DEME
Wilkes	RA	10 Coy
Willard	RE	1 AAU
Williams	DB	7 Coy
Williams	W	2 Coy
Willis	RR	6 Coy
Wilson	FL	Pers RCEME
Wiltshire	CAJ	AEEE
Winegarden	GW	RCEME School
Wolfenden	R	RCSA
Wright	WF	HQ CBUE
Wright	WH	CADEE
Yorker	KAF	RCEME School
Young	RM	13 Coy

'YES-MEN' COMPOUND ERRORS

Status and stupidity can be a communication-wrecking combination, a laboratory experiment at Stanford University indicates. Sociology professor Sanford M Dornbusch reports that students accepted the authority of a 'supervisor' even when his telephoned instructions were clearly false. They turned out the work and effectively participated in his program.

Why this unquestioning obedience? American society readily accepts bureaucracy and the fact that in every organization someone must give orders. As a result, individuals follow a behaviour pattern dictated by office and status, not their own reactions.

In plants, the wrong instructions from a supervisor can very likely be transmitted and followed all the way down the line without question. And this doesn't even consider the distortion caused by individual interpretation of instructions as they pass from one worker to another. So get a playback of your instructions and encourage questions to correct errors.

-Factory

MILITIA TRAINING

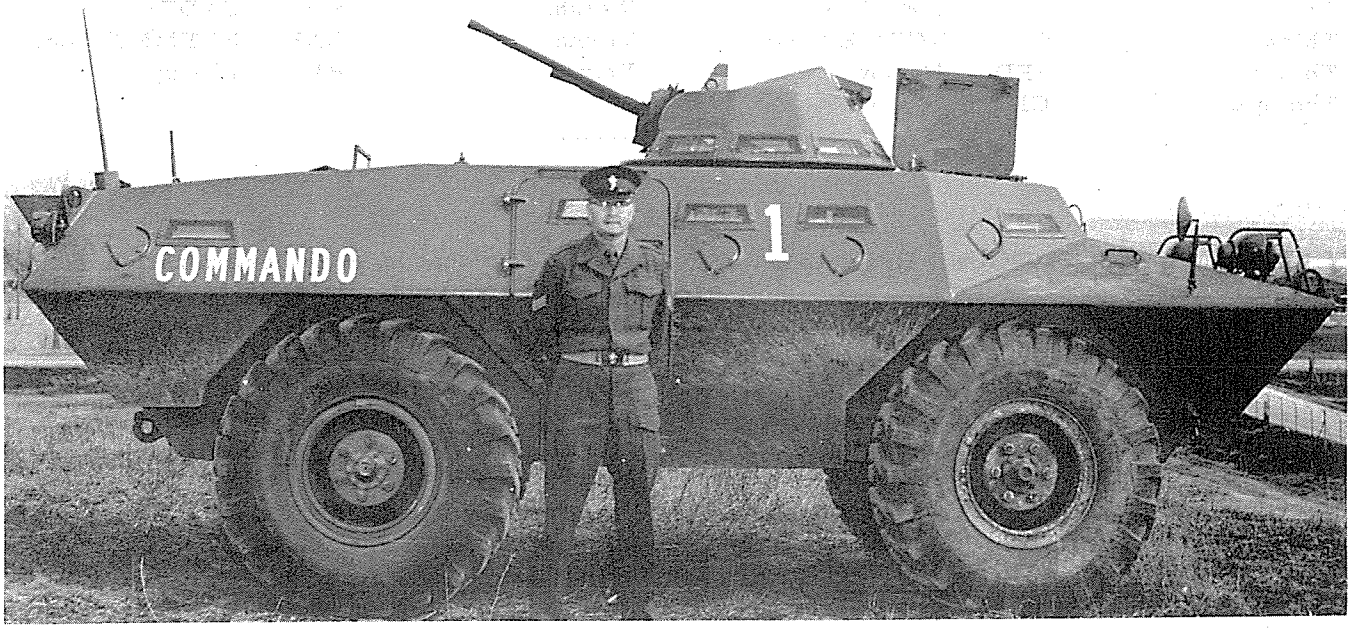
WO1 Archie Vawer, 1st Montreal Service Battalion, gives the go ahead signal to recover an upset vehicle during the special training for Militia units at Camp Farnham. Sgt Paul De Launiere, 25 Tech Sqn, Arvida, Que, works the tow lines. -DND Photo

BEST SHOT

Capt JE Coates, OC 208 Wksp RCEME, presenting Cpl Bob Kingsbury with a trophy for high aggregate score for the year in the Uplands Rifle Club.

COMMANDO ARMOURED VEHICLE
(Under evaluation tests by AEEE)

Sgt NE Carter, AEEE Experimental Wing, shown in front of vehicle under test there. This is an amphibious 12-passenger troop carrying armoured vehicle. It is powered by 220 hp engine, has 'standard-parts' transmission with five forward speeds and one reverse. Its 84-gallon fuel capacity gives it a range of 550 miles, at a maximum speed of 60 mph. -AEEE photo



AMERICAN MOTORS

Service Letter

These American Motors 1962 Service Letters are applicable to the Rambler Station Wagon bought off CD 163967 and this information should be passed on to the repair sections in the Workshop and held with Repair Manual AM-62-1016.

BLEEDING INSTRUCTIONS FOR AMERICAN MOTORS CARS EQUIPPED WITH SPLIT SYSTEM MASTER CYLINDERS

Whenever the master cylinder has been removed from the car and the brake lines have not been drained of fluid, the following procedure should be followed so as to insure an adequate bleed on the replacement master cylinder.

1. Clamp the master cylinder in a vise in a horizontal position and fill the reservoir to the bottom of the threads with brake fluid.

2. Depress the primary piston fully with the outlet ports open and hold until both outlet ports have been completely sealed off using two fingers. When the outlet ports are sealed off, release the piston and allow it to return fully.

3. Repeat operation #2 six times until a clear stream of fluid is ejected from the master cylinder when the piston is depressed.

4. Refill the master cylinder with fluid to the bottom of the threads and assemble on the car.

5. Depress the brake pedal building up moderate pressure in the brake system. With pressure on the system, crack the front brake outlet fitting and allow the pedal to depress as far as it will go. Hold the pedal in this depressed position while the tube fitting is being re-tightened and then release the pedal and allow it to fully return. Repeat the operation, cracking the rear brake outlet fitting.

6. If the top of the pedal on cars equipped with manual brakes is less than 3" to the floor mat with 32 lbs applied to the pedal, repeat operation #5.

7. Should the pedal height on manual units measured from the top of the pedal to the floor mat still be less than 3", check the pedal free play and adjust with the eccentric to a value of not more than 3/8" nor less than 1/8" as measured at the pedal. Should this adjustment not be obtainable, check on all manual brake systems for the presence of the rubber bumper at the bottom of the push rod hold. Also, check each brake adjustment which should not exceed 20 clicks from a tight drum condition and the free pedal height from the floor mat which should be in excess of 6" measured from the top of the pedal to the floor mat.

FRONT SUSPENSION AND STEERING - 1962 SERIES

The following front suspension specifications apply to the 1962 Series:

Rambler American Series

Caster	
Without Power Steering	0° Desired + - 1/4°
With Power Steering	1-1/2° to 2° Positive, 2° Desired
Camber	
Right Side	1/4° Negative to 1. 4° Positive, 0° Desired
Left Side	1/4° Positive Desired
Toe-in	1/16" to 3/16", 1/8" Desired

Rambler Classic 6 and Ambassador V-8

Caster	
Without Power Steering	0° Desired + - 1/4°
With Power Steering	1/2° to 1° Positive, 1° Desired
Camber	
Right Side	1/4° Negative to 1/4° Positive, 0° Desired
Left Side	1/4° Positive Desired
Toe-in	1/16" to 3/16", 1/8" Desired

OPENING STATION WAGON TAILGATE WHEN THE GLASS CANNOT BE LOWERED - 6210-80 SERIES

In cases where a tailgate glass is in the raised position and cannot be lowered with the regulator and handle, the tailgate can be opened in the following manner:

From the inside of the car, measure 15-7/8" from each end toward the center on the inner tailgate panel and 2-3/8" down from the top ledge. Center punch and cut a 1-1/4" hole where these two measurements intersect. This can be done with a 1-1/4" hole saw.

The regulator arm to glass bottom channel retainers can be removed with a screwdriver inserted through the holes.

Then pry the glass upward slightly and push the arm studs from the glass bottom channel. The glass can then be lowered so that the tailgate can be opened for necessary repairs.

Use Plug Button, Part Number 3416819, to close the two 1-1/4" holes.

LOSS OF ENGINE OIL PUMP PRIME - 6110-6210 SERIES (ALUMINUM ENGINE BLOCK)

Loss of engine oil pump prime or slow rise of oil pressure may be the result of the installation of an oil filter which does not contain a check valve which prevents the oil filter from draining during periods when the engine is not in operation.

Engine oil filter location determines the type of oil filter that must be installed to prevent possible engine damage due to insufficient oil supply.

Listed below are part numbers of oil filters and series application:

SERIES	PART NUMBER
Late 5920-80 and ALL 60-6120 and 80 Series V-8 Engine	8990688 8990873 8991072
6280 Series and 61-6210 Series with Aluminum Cylinder Block	8990873 8991072
1958 thru 6201 L-Head and OHV Engine and 1960 thru 6210 Series OHV Engine With Cast-Iron Cylinder Block	8990508

Oil Filter, Part Number 8990688, may be installed only on late 1959, all 1960 and 1961 V-8 engines. Filter, Part Number 8990688, NEVER should be used on 61-6210 Series aluminum cylinder block engines.

STEERING GEAR JACKET TUBE, LOWER NYLON BUSHING – ALL SERIES

On cars where the subject bushing does not include an oiler, a scraping or binding condition may be apparent due to lack of lubrication at the subject lower nylon bushing.

This condition may be corrected by drilling a 1/8" hole above the nylon bushing and applying oil through the hole to lubricate the steering shaft and bushing.

FRONT WHEEL TURNING RADIUS STOPS – 6210-80 SERIES

On extreme turns to the point when the steering wheel stop on the strut rod contacts the steering arm, a noise problem may be evident due to a rubbing action between the two surfaces. This would be noticed particularly during a sharp turn in or out of a driveway.

The noise can be alleviated by slightly rounding the square edge of the strut rod contact area either by filing or grinding. Then apply a small amount of fiber grease to the contact points to further minimize the rubbing action.

FRONT COIL SPRING SPACER PART NUMBER 3204474 - 5010 THRU 5510, 5801 THRU 6301

An aluminum ally front spring spacer of 1/4" thickness, Part Number 3204474 (Group 11.075), is being made available as a Zone Stock Item to assist in leveling a car that leans at the right or left front corner.

The spacer is to be installed on the spring seat with the spring cushion and spring resting on the spacer. In the usual installation, one 1/4" spacer will raise the affected corner approximately 3/8"; two spacers will raise the corner about 3/4".

Where two spacers are required on a spring, safety requires that one spacer be placed on the upper spring seat and one on the lower spring seat.

PREMATURE FAILURE OF 1962 - 1963 - 10-80 REAR SHOCK ABSORBER, UPPER GROMMETS

It has been found that the early replacement of the upper shock absorber grommets is due to insufficient crush on the rubber grommets.

When replacing the grommets check the hole in the upper washer and if it is not large enough to go over the shoulder of the shock bayonet, discard this washer and replace with two washers, part number 3146809.

One washer on top of the upper grommet is not enough to create sufficient crush to prevent the lips on the grommet from cutting out.

In later production, part number 3146809 washer was used, (larger hole in washer) - in this case add one more washer to increase the crush on the rubber.

We would suggest that dealers carry sufficient stock of part number 3146809, Group No 11228 shock retainer for use as required.

How to be an Expert Painter With a Spray Can

Probably everyone in this push button age has painted something with an aerosol sprayer, usually with good results if the job was done according to Hoyle. Often failure to achieve the desired effec is due to some form of neglect.

The Kerr Chemical Company has come up with some words that pretty well explain spray cans, their care and contents — in this case, DuPont Dulux finishes. A perusal of the facts contained herein may aid in eliminating the problems that have troubled us.

As you know, aerosol containers are dished at the bottom for strength. The spray heads are attached to a siphon tube reaching into the chime at the bottom, which is the deepest point between the wall of the can and the high center. When the nozzle is open, compressed gas forces paint up the tube. It is broken into tiny droplets by the nozzle and expelled in a cone-shaped pattern about four inches in diameter at a point one foot from the nozzle.

Naturally, after a period of storage, the pigments and resins settle to the bottom of the can. Ordinarily, the manufacturer provides a ball agitator. This is what you hear rattling when you shake the can. A ball, however, can't stir the pigment collected in the chime. Minit Spray finishes provide a special "T"-head rivet agitator. The arms of the "T" can reach into the chime to provide a complete mix.

Sometimes the agitator becomes imbedded in the pigment. To mix the paint, shake the can until the agitator rattles. *Then shake for one full minute more.* Holding the can near the top and moving the bottom in a circular motion rolls the agitator through the pigment and stirs more thoroughly than the common up and down shake. True color reproduction and a clog-free nozzle and siphon depend on a thorough shaking job.

Even under ideal conditions, it is advisable to mask the area surrounding the object or surface you intend to paint. Ideally, the air temperature should be about 70°. If outdoors, paint on calm days or in a sheltered area where the wind won't be a factor.

Hold the spray can 12 to 14 inches from the object. Be sure the nozzle is aimed properly, and press. Move the can as you would a brush. Stroke slowly in one direction. Stop the spray at the end of each stroke. If you move too slowly, the coating will run and drip. Should this happen you'll do better to stop, wipe off the paint and start over.

It's better to apply a thin, even coat and go back after a few minutes to get coverage and hiding quality. Aerosols are generally quick drying. You can apply a second coat in as little as 5 minutes.

Paint any hard-to-reach places first. When the can is full, you can hold it in any position to spray. Finish up on accessible, vertical surfaces where the can may be held vertically, nozzle up. While there is more than enough propellant to exhaust the can, remember the siphon reaches to the bottom. When a nearly empty can is tilted, the siphon may not be in paint.

While painting, pause occasionally and shake the can to keep the paint mixed. Shaking has no effect on the propellant gas. If the spray seems to lose force, clear the nozzle.

When the job is done and there is paint left in the can, clear the nozzle by turning the can upside down. Press the button and hold it for about one second. Aim the nozzle at a drop cloth or piece of newspaper as some paint will be forced out of the siphon and valve.

If necessary, the spray head can be pulled out and cleaned by running a pin along the metering slot at the base of the tip. Replace the spray head on the valve carefully to avoid releasing any paint. Finally, wipe off any paint collected around the nozzle and protect it with the cover of the can.

Some painting problems which may be encountered:

1. Dripping or running – Holding the can too close to the surface, or moving the can too slowly, puts on too much paint. Wipe it off and start over.

2. Insufficient coverage – Usually this results from holding the can too far away from the surface. Paint dissipates into the air. Hold the can 12 to 14 inches from the surface you are painting.

3. Coating off-color – Incomplete mixing before painting allows the pigment to lie in the bottom. Shake the can thoroughly as directed.

4. Clogged nozzle – Incomplete mixing leaves clumps of undissolved pigment and resins which may clog the siphon or spray head. Turn the can upside down and clear the tube with a jet of gas. If this fails, remove the spray head and clean the metering slot.

5. Clumping or blobs – Incomplete mixing may allow small clots of pigment and resins to pass the nozzle and splatter blobs on the surface. Also, if you hold the can too close to the surface, the paint does not have time to atomize sufficiently. Wipe off and start over.

American Airlines
Weekly Maintenance Letter